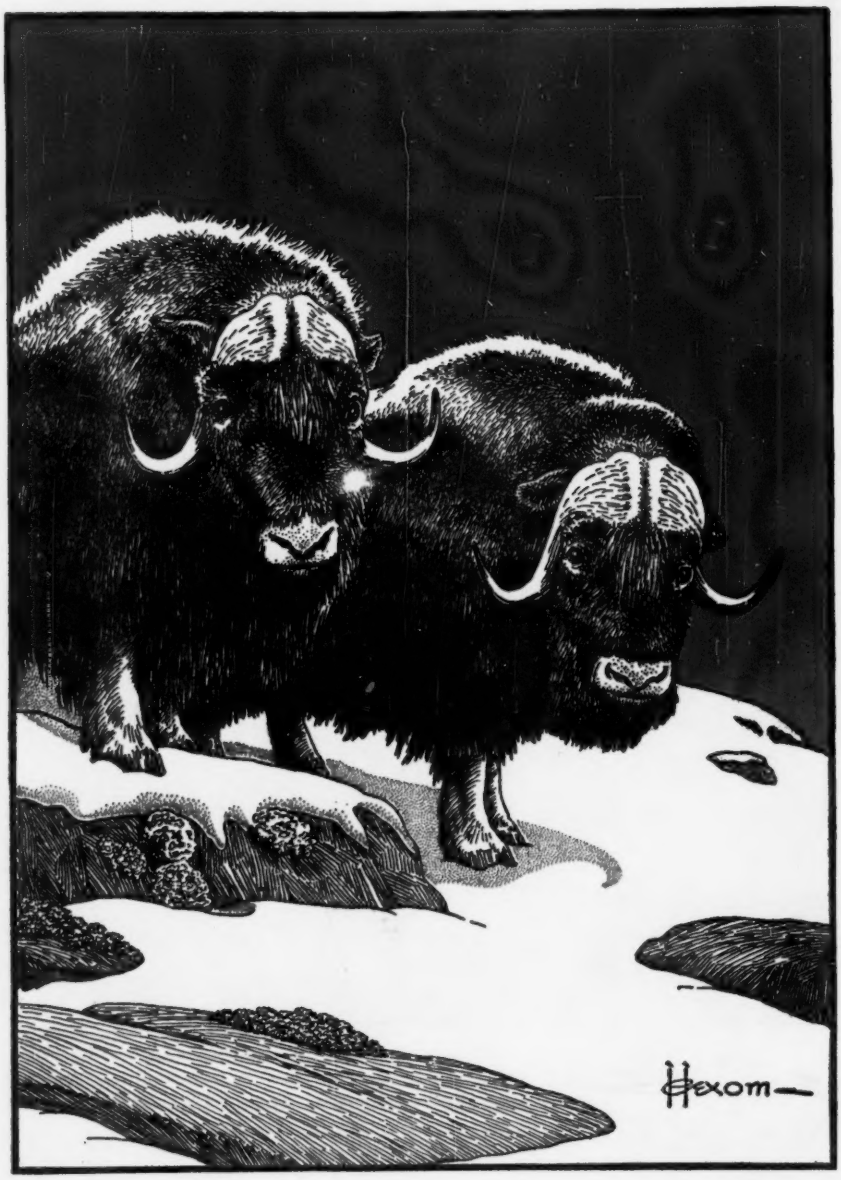
Nature Magazine



MARCH
1956

VOLUME 49
NUMBER 3

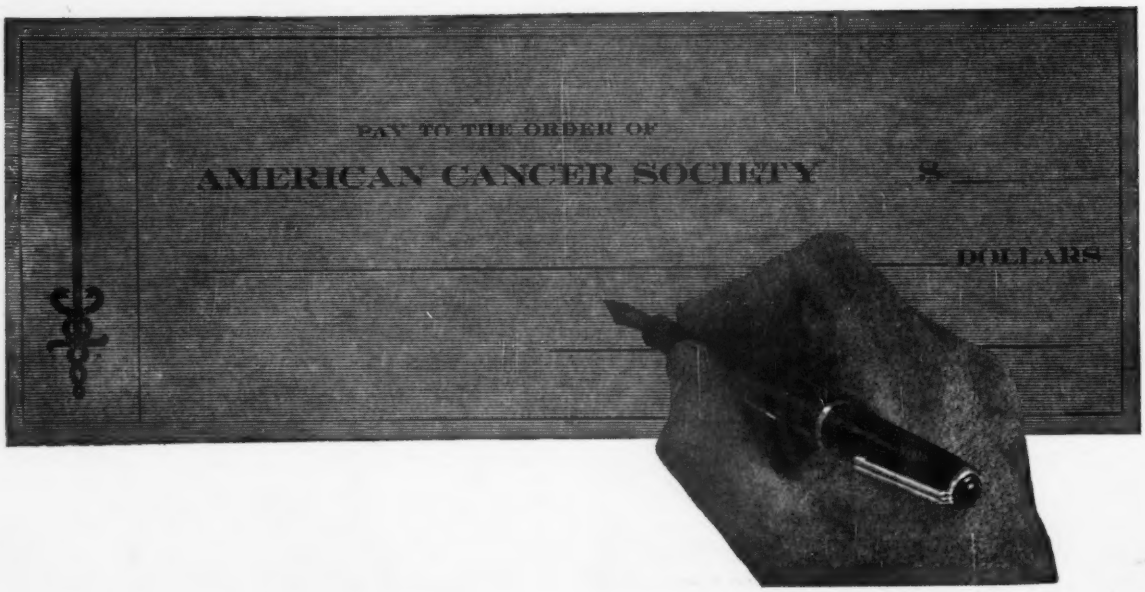
50 Cents

A checkup

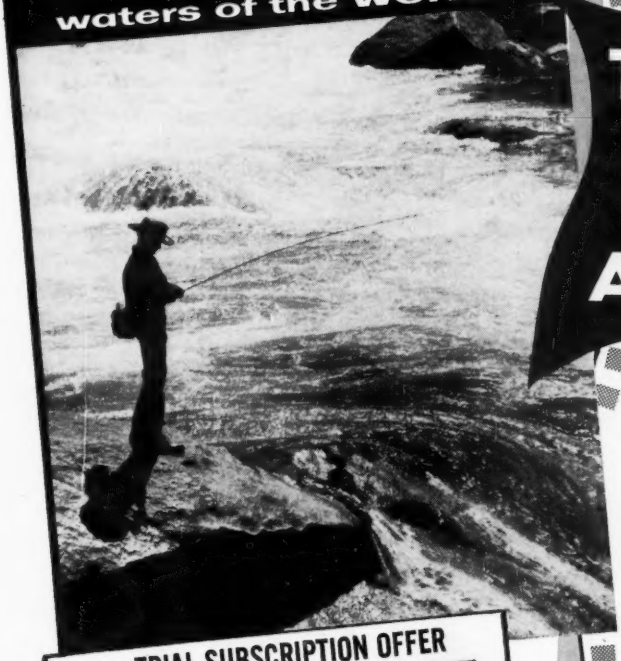
Of every 100 persons who get cancer 25 will be saved, 75 will die. Of these, many will die *needlessly*, because with present knowledge they could be saved by early detection and prompt treatment. Play fair with yourself and your family . . . have that cancer checkup soon.

and a check

There has never been enough money to carry on all the research that needs to be done. Can you afford to remain indifferent to the enemy that strikes 1 out of every 4 Americans? Your donation—large or small—can help save lives. Someday, perhaps your own.



Fishing
waters of the world



Every Fisherman's Dream Come True!

Re-Live and Thrill to the excitement of

The Greatest TRUE FISHING ADVENTURES

—from every corner of the Globe!

America's Newest Fishing Magazine Devoted Exclusively to Real-Life Stories and Photos of Prize Catches Made in the Most Famous FISHING WATERS of the WORLD!

You'll tingle with the instantaneous tension that comes from making the big strike . . . your pulse will quicken with excitement . . . your imagination will be stirred with high adventure as you read the true-life stories in America's newest fishing magazine. Each and every issue will take you on a magic carpet to fabulous fishing spots all over the world!

Excerpts from a few unsolicited testimonials: "Each and every story is superb." . . . "I enjoyed every page and I'm proud to be one of your charter subscribers." . . . "Last issue was great. Especially the photographs."

For the next six months you can experience the true-story reality of global fishing in the best known fishing grounds of the world for only $1. "FISHING WATERS of the WORLD" is the sport fisherman's paradise come to life.

WITHOUT RISKING A PENNY
Send for your 6 Trial Issues for only $1
SATISFACTION GUARANTEED or your money back!

TRIAL SUBSCRIPTION OFFER
6 ISSUES FOR ONLY $1
(YOU SAVE $1.10)

EACH ISSUE AN ENCYCLOPEDIA OF FACTS ON —
Line & Reels • Boats • Motors • Lures • Camping Equipment • Photography • Cooking • Latest Fishing Laws • Fishing Cartoons & Jokes • Photos & Information on Fresh Water and Ocean Fish

READ WHAT'S NEW IN —
Fishing from a rowboat, outboard, charter boat and party boat fishing, fishing off docks, bridges and from the shore • You'll read all about casting and bait in stream, lake and pond fishing. Edited by Lawrence Kelly, skipper of one of the Viking Fleet boats out of Freeport.

Read and enjoy these regular monthly features:
TACKLE TALK, by Dick Charles • SALT WATER FISHING, by Capt. Frank Moss, popular Montauk & Floridian Charter boat skipper & fishing writer • FRESH WATER FISHING by George X. Sands, well known Florida sportsman • FEATURE FISH, by Francesca LaMonte, Associate Curator of Fish, American Museum of Natural History and Secretary IGFA.

You must be delighted with your very first issue or your $1 will be promptly refunded.

- The most complete source of information for the experienced fisherman
- An essential primer for the beginner

Stream, Lake & Pond Fishing — Salt Water Fishing — Surf Casting — Ice Fishing

Fishing
waters of the **world**

Dept. FW1 50 West 57th Street, New York 19, N. Y.

FISHING WATERS of the WORLD, Dept. FW1
50 West 57th Street, New York 19, N. Y.

Enclosed is $1 bill, check or money order. Please send me my Trial Subscription for 6 issues at a saving of $1.10. I must be delighted with my first issue, or you will promptly refund my dollar.

Name.....
(please print)
Address.....
City.....Zone.....State.....

(This offer limited to new subscribers only)

Nature Magazine

MARCH, 1956 VOL. 49, NO. 3

Published by the **AMERICAN NATURE ASSOCIATION** to stimulate public interest in every phase of nature and the out-of-doors, and devoted to the practical conservation of the great natural resources of America

IN THIS ISSUE

Nature in Print ..... *Howard Zahniser* 116
Contents Noted ..... *R. W. W.* 119
Assault upon Olympus (Poem) ... *Bessie Berg* 120
Will-o-the-Wisp of the Border Hills ..... *John Lindsey Blackford* 121
Dusk on the Desert (Poem) .... *Ethel Jacobson* 124
Corkscrew Sanctuary ..... *Anne LaBastille* 125
Skiagraph ..... *Edward C. Day* 128
Nebraska's Volcano ..... *Richard L. Threet* 129
Let's Go Rock-Hounding (Quiz) *Mabel Irene Huggins* 130
The Hellbender .... *C. J. Stine & J. A. Fowler* 131
Nutmeg ..... *Elsie A. Parry* 133
Alexander Wilson ..... *W. L. McAtee* 135
Purple Heart Award .... *Ruth Seymour Vesely* 136
Consider the Lilies ..... *E. Laurence Palmer* 137
Nature's Harshness and Man's Compassion ..... *Alexander F. Skutch* 145
En Route (Poem) ..... *Marjory Titus Greene* 147
Dogwood in Spring (Poem) *Julia Collins Ardayne* 148
A Little Frog with A Big Voice *Nell Murbarger* 149
Unloved Thornapple ..... *Ralph J. Donahue* 149
Operation Diana ..... *Leonore Brandt* 150
The Diary of the Rosies ..... *Helen A. Rogers* 153
Comets ..... *Simone Daro Gossner* 156
My Son, Age Eleven (Poem) .. *Lois Anderson* 157
Nature in the School ..... *E. Laurence Palmer* 158
The Nature Camera ..... *Edna Hoffman Evans* 161
Nature and the Microscope *Julian D. Corrington* 166

THE ASSOCIATION

President
RICHARD W. WESTWOOD ..... *Washington, D. C.*
Vice-President
HARRY E. RADCLIFFE ..... *Washington, D. C.*
Secretary-Treasurer
JAMES A. O'HEARN ..... *Sea Girt, N. J.*
Director, Nature Education
DR. E. LAURENCE PALMER ... *Cornell University, N. Y.*
President Emeritus
ARTHUR NEWTON PACK ..... *Tucson, Arizona*

SCIENTIFIC CONSULTING BOARD

DR. WALDO L. SCHMITT
Head Curator, Zoology, U. S. National Museum
DR. HARRY C. OBERHOLSER
Retired Ornithologist, U. S. Fish and Wildlife Service
W. L. McATEE
Retired Biologist, U. S. Fish and Wildlife Service
DR. PAUL BARTSCH
Retired Curator of Mollusks, U. S. National Museum
DR. EDGAR T. WHERRY
Wild Flower Preservation Society
DR. WILLIAM M. MANN
Director, National Zoological Park
DR. W. H. ANDERSON
Entomologist, U. S. National Museum

THE MAGAZINE

RICHARD W. WESTWOOD ..... *Editor*
EDWARD A. PREBLE ..... *Associate Editor*
JULIAN D. CORRINGTON ..... *Microscopy Editor*
SIMONE DARO GOSSNER ..... *Astronomy Editor*
E. LAURENCE PALMER ..... *School Editor*
HOWARD ZAHNISER ..... *Book Editor*
EDNA HOFFMAN EVANS ..... *Photography Editor*
HARRY E. RADCLIFFE ..... *Business Manager*
LAURENCE E. CROSBY ..... *Advertising Manager*
LAURENCE LUSTIG ..... *Art Consultant*

ADVERTISING OFFICES

New York 71-4673 Delafield Ave. KIngsbridge 8-5602. Los Angeles 5-2978 Wilshire Blvd. San Francisco 4-Mills Building
Washington 6-1214 16th St., N.W. Minneapolis 2-502 National Bldg.

SUBSCRIPTION RATE

NATURE MAGAZINE is published monthly, October to May, inclusive, bimonthly, June to September, inclusive, by the American Nature Association. Entered as second-class matter May 31, 1927, at the post office at Washington, D.C., U. S. A., and accepted for mailing purposes at the special flat rate of postage provided for in the United States Postal Act of October 3, 1917, and February 28, 1925. U. S. and Canada one year, $4; foreign, $1 extra; two years, $7; life, $100.

Publication and Editorial Office, 1214 16th Street, N. W., Washington 6, D. C. Additional office of publication, Easton, Pa.

Copyright, 1956 by American Nature Association, Title Registered U. S. Patent Office. Printed in the United States.

Nature Magazine past and present, is indexed in The Reader's Guide in your public library.

Kinship with All Life

By J. Allen Boone. New York. 1954. Harper and Brothers. 157 pages. $2.50.

Here is a book that did not come to us for review when it was first published, and its value was recently called to our attention by an alert reader. We asked Harper and Brothers for a review copy and are happy that they complied, for here is something of special interest to all truly interested in the so-called "dumb creatures."

The author was a close friend of Jane Murfin, playwright, and Larry Trimble, producer, who brought the great canine actor, Strongheart, to this country and, with his notable cooperation, made him one of the greatest box-office attractions in movie history. Mr. Boone became for a period the companion of this amazing dog, and in their intimate relationship discovered what he describes as a two-way mental bridge between the dog and himself over which traveled unspoken thoughts and understanding. He demonstrates that Strongheart was not only a marvelously trained but a truly educated dog, training and education being by no means synonymous. Mr. Boone's experiences with the dog are amazing and fascinating and cannot be reduced to the capsule of a review paragraph.

About the first half of the book is devoted to Strongheart, and the balance to the ability to understand animals that the author learned from the dog. He cites the case of the late Grace Olive Wiley, herpetologist, whose mental attunement with even the most poisonous reptiles was an example of the two-way mental bridge in another area. And, Mr. Boone points out, rattlesnakes hate white men as much as white men hate them, but between Indian and rattler there is a sympathy and understanding.

Skunks also come in for attention —and understanding. Other animal experiences bear out the conclusion Mr. Boone reached through his educational period with Strongheart. Although tardily, we urgently commend this book to the thoughtful lover of creatures of the wild. R.W.W.

The Art of Falconry

By Frederick II of Hohenstaufen. Translated and edited by Casey A. Wood and F. Marjorie Fyfe. Boston. 1955. Reprinted by arrangement with Stanford University Press by Charles T. Branford Company. cxii plus 644 pages. Illustrated. $20.00.

This imposing and valuable volume is the first translation of the important medieval treatise on zoology and falconry by Frederick II, one of the most brilliant and versatile exponents of falconry. He was also a mathematician, philosopher and naturalist and even made contributions to architecture, medicine and the law. The Emperor's studies of the structure and habits of birds, and his discussion of migration are fascinating reading today.

In addition to Emperor Frederick's dissertation, this volume includes a chapter by Cresswell Shearer on the castles and hunting lodges of the Emperor. Appended material includes other chapters and articles on falconry, among them one on the art today, by Walter Schluter, and another on coins and medals on which falcons and falconry are displayed. There is an annotated roster of the birds mentioned and an annotated bibliography. Altogether this is an interesting and valuable book that should find a ready if specialized audience. R.W.W.

Mice in the Ink

By Ethel Jacobson. Brea, California. 1955. The Progress Press. 93 pages. Illustrated by the Author. $2.95.

From time to time bright and whimsical poems by Ethel Jacobson have appeared in the pages of *Nature Magazine*. But to have her poems collected in a book is a special delight, and this second collection—the first was *Larks in My Hair*—is such a delight. Most of this poet's verses are in the lighter vein, but when she turns serious for a bit she is equally a master of the deft expression. Many of her verses find their inspiration in Nature, of which she is a keen observer and to the conservation of which she is dedicated.

Ornamental Trees

By Evelyn Maino and Frances Howard. Berkeley, California. 1955. University of California Press. 219 pages. Illustrated by Evelyn Maino. $3.75.

This is an illustrated guide to the selection and care of more than three hundred ornamental trees, 182 of which are illustrated. An introductory brief chapter covers the use and general care of trees, and the trees considered are grouped as deciduous, broad-leaved evergreens, conifers and palms or other tropicals.

All-the-West *Vacations* ON THE GREATEST WESTERN FLEET

Such fine trains as the CITY OF SAN FRANCISCO, CITY OF LOS ANGELES and the Super Dome OLYMPIAN HIAWATHA. Surprisingly low round trip fares. Fine food, friendly service. Go one way, return another.

Free Planning Help

① **COLORADO ROCKIES**—Denver—Rocky Mt. Nat. Park—Estes Park—Colorado Springs—Pikes Peak.

② **SALT LAKE CITY**—Mormon Capital. Arizona-Utah Parks: Zion—Bryce Canyon—Cedar Breaks—Grand Canyon north rim.

③ **CALIFORNIA-NEVADA**—Los Angeles—San Diego—Hollywood—Santa Barbara. San Francisco—Del Monte—Monterey—Yosemite—Reno—Lake Tahoe. Las Vegas' famous "strip"—Hoover Dam.

④ **YELLOWSTONE PARK**—geysers—great waterfalls, colorful canyon—wild life—Grand Teton Park.

⑤ **PACIFIC NORTHWEST**—Seattle-Tacoma—Olympic National Park—Mt. Rainier in Washington. Portland—Columbia River—Mt. Hood—Crater Lake in Oregon.

⑥ **SUN VALLEY**—all-year resort.

⑦ **DUDE RANCHES**—Western Mts.

⑧ **ESCORTED TOURS**—anywhere West.

H. Sengstacken, The Milwaukee Road
819 Union Station, Chicago 6, Ill.

I am interested in vacations 1 2 3 4 5 6 7 8 (circle choices). Please send free literature.

*Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

THE MILWAUKEE ROAD

Nature IN PRINT

By HOWARD ZAHNISER

Healing Wilderness

"THESE MOUNTAIN AND LAKE districts, which form the wilderness of northern New York, give to the tourist most exquisite sensations, and the physical system appears to take in health at every pore," wrote the engraver-author Benson J. Lossing nearly a century ago in his self-illustrated, now charming as well as instructive volume entitled *The Hudson, from the Wilderness to the Sea*. "No wild country in the world," he averred, "can offer more solid attractions to those who desire to spend a few weeks of leisure away from the haunts of men." And he reported: "Invalids go in with hardly strength enough to reach some quiet log-house in a clearing, and come out with strong quick pulse and elastic muscle."

A little more than three years ago our contemporary in the faster-moving, more highly mechanized, more perplexing, complicated world of this century, Miss Martha Reben, bore similar testimony to our still-living Adirondack wilderness in a book that she called *The Healing Woods*. For a few days less than six months, as she related in that volume, she—a Saranac Lake, New York, patient in the advanced stages of tuberculosis after "three years of bed rest and as many operations"—abandoned her treatment and, responding to the advertisement of an experienced and inspired guide, Fred M. Rice, of Saranac, lived in a tent by Weller Pond in this wilderness. When she was healed of her malady, as indeed she was, she continued, with her guide, "to return to the woods each summer," and she testified:

"The wilderness did more than heal my lungs. While it dwarfed me by its immensity and made me conscious of my insignificance, yet it made me aware of the importance of an individual, capable of thinking and feeling not what was expected of me, but only what my own reasoning told me was true. It taught me fortitude and self-reliance, and with its tranquility it bestowed upon me something which would sustain me as long as I lived: a sense of the freshness and the wonder which life in natural surroundings daily brings and a joy in the freedom and beauty and peace that exist in a world apart from human beings."

Renewed testimony

In a more recent volume entitled *The Way of the Wilderness* Miss Reben verifies with high eloquence her earlier testimony and out of the depths of most poignant personal tragedy vouches for the validity of her faith in the sustaining qualities of what the wilderness in its healing had already bestowed upon her. She saw, "with a sudden awareness, that living was more than joy and mirth and contentment, that it was suffering and enduring as well; that only through living could life be understood." As her book closes, she—the one who so recently had despaired of lung and life—has climbed an Adirondack mountain and, her old quilt wrapped about her, has fallen asleep there by her fire, somewhere around two-thirty in the morning—after resolving her tragedy with the simple determination: "I would cut living to the bone and buy time for writing and studying with the things I did without."

The writing and studying that are expressed in *The Way of the Wilderness* are, of course, a sequel to the experience with which the book itself ends. The richness of the thought and understanding that have resulted and the persuasiveness of their expression are evidence of the depths of the whole experience. Miss Reben, more through simple narrative than by comment, infectiously conveys to us the interest and charm of her life in the village, in her own small house at the edge of town, in her attempts at earning a living through village vocations, and then lures us along with her to her lakeside wilderness summer camp where—so interested, so charmed, so delighted with the allurements of her abundant living in village and wildland—we are at last introduced to the poignance that (so far all unawares to us) has given to all these experiences their vividness. It is a great book.

Far to the southwest, in New Mexico, Elliott S. Barker—not through any creative art of authorship but by straightforward reminiscent narrative—has also documented the validity of wilderness ministrations to human health and happiness. Not through tragedy but in the pervading joy of high good fortune, not in a miraculous healing of an insidious illness but in the remarkable attainment of strength and vibrant health renewed whenever worn, not through therapy but through hygiene and the wisdom of medicine that prevents rather than cures, does Elliott Barker teach us the same wilderness values that Martha Reben reveals. Miss Reben teaches us compassion for those who suffer early the loss of dear companionship; Elliott Barker inspires in us the hope and joy that come with a lifetime comrade. His dedication is most touchingly eloquent: "To Ethel who, after forty-two years, three children, and nine grandchildren, still loves to pack back into the beautiful Pecos high country with me to fish for trout and to camp beneath a canopy of drooping spruce boughs at the edge of some pristine flower-spangled park."

The Pecos Wilderness

It is interesting, and paradoxical, that Mr. Barker's volume, devoted to the description, praise, and preservation of one of our greatest national areas of wilderness, should be entitled *Beatty's Cabin*. Mr. Barker is, indeed, one of our outstanding exponents of wilderness and perhaps the individual most deeply devoted to the Pecos wilderness. His "fervent prayer" is "that the Pecos Wilderness Area may be perpetuated in its inspiring, pristine state so that our grandchildren and their children, down through the ages, may have the opportunity to enjoy and commune with nature there as has been my good fortune." For him Beatty's Cabin is an instrument of recollection, relic of the days of the pioneer who built it—goal of Mr. Barker's own early trips into this area before threats to such wilderness caused men to label them wilderness and protect them as such, a goal that now seems like a sort of shrine, for pilgrimage. Such structures are not proper in such areas, and I suspect that Elliott Barker would resist with deep earnestness any proposal to add

another cabin, even though he may look with kindliness on the successors to Beatty's—the U.S. Forest Service and State game department administrative cabins now located "across the creek." Beatty's cabin itself was abandoned, its dirt roof caving in, when first Mr. Barker saw it, half a century ago. It is the place not the structure that the name recalls. "Now there is left only a heap of earth and stone where the fireplace once stood. But the place is still known as 'Beatty's Cabin' and it is the most noted spot in the entire Pecos Wilderness Area, now having come to mean the general locality." Thus Mr. Barker explains the name. It is apparent that for him "Beatty's Cabin" means wilderness.

Mr. Barker has known this Pecos wilderness (in northeastern New Mexico not far from Santa Fe) since long before men gave it any such classification. As a ranger in the national forest that contains the wilderness and as head of the game department of the State, as well as a resident of the environs, he has become identified with it. For the American Forestry Association's trailrider trips into this wilderness (one of the most enjoyable of all) he is at once guide and hero.

History of wilderness

Mr. Barker's book is a history of this wilderness as he has observed and known it. He describes it, tells its lore, and shares with his readers his own adventures and experiences. He writes the history of its preservation and administration. He laments the extirpation of the elk and comments: "The sequel, equally tragic, is that when the herds of elk were gone and cattle put on the summer range in their place, grizzly bears naturally took to killing the cattle to such an extent that, a few years later, to make the wilderness safe for cows, nature's crowning wildlife achievement, the mighty grizzly, was likewise extinguished." With a like sensitiveness he records "the untimely passing" of the wild bighorns and notes that then "the jagged crags and templed peaks very definitely lost something of their hereditary charm and glory." Now, he writes with descriptive eloquence, "on timber-line ridges and in the coves, alpine clover each year send up its velvety, gray-green leaves and pink-white blossoms in supplication for the return of God's free wild creatures who once fattened upon its succulence. But none return to eat it. The brow of the high, grassy hills, furrowed and wrinkled by unnatural gullies, frown disapprovingly upon the substitution of herds of domestic woolies for the little bands of wild bighorns that once scanned the glorious landscape from their crests." Thus Elliott Barker not merely collects the history of this area; he remembers it.

Warning of the future

Yet he does not disparage the present with an idealization of the past. "The years," he writes, "have been kind to this paradise." And he looks ahead, concluding his volume with a warning against motor roads, commercialization of resources, and despoliation—and with this final prayerful sentence:

"For the good of future generations may the Pecos high country never be so defiled."

Concluding an account of one of his latter day trips with his wife to Beatty's Cabin—the place not the structure—where they camped under spruce trees, Mr. Barker remarks: "Days and nights like those, spent in the great outdoors, are times when one really lives with all his heart and soul and mind, and the joyous memory of living them never fades." There are millions, he prophesies, "who should be encouraged to get out once in a while where they can enjoy the invigorating thrills and soul-satisfying inspiration of the unspoiled wilderness," and for them he says, "let us preserve for all time a few spots with primeval conditions in their original pristine beauty and majesty." Out of the joy of his own recollections he senses the needs of others for the same healing resorts that meant so much to Martha Reben in the Adirondacks.

Beatty's Cabin: Adventure in the Pecos High Country. By Elliott S. Barker. The University of New Mexico Press (Albuquerque). xii + 220 pp. (6⅛ by 9¼ in.), with 32 photographs on 16 plates, front endpaper map of "Pecos High Country", symbolic drawing of cabin and spruce trees appearing 20 times, no index alas. $4.50.

The Way of the Wilderness. By Martha Reben. New York: Thomas Y. Crowell Co. 1955. 276 pp. (5⅝ by 8¼ in.), with frontispiece photograph of "the author with Mr. Rice." $3.50.

TESTA WIDE FIELD MICROSCOPE

A Sturdy, Standard-sized, American-made Microscope with WIDE FIELD and 15x, 45x, 75x MAGNIFICATION for Live Nature and Whole Specimen Study in or outdoors.

Unusual versatility in use is one of its outstanding features. In addition to normal position for desk work, arm or tube may be inclined or reversed to operate in any direction of a 360° circle. Tube removable for field trips.

Price of Model A, illustrated, is $47.50. This includes not one but all three magnifications, 15x, 45x and 75x, coarse and fine focusing. Achromatic objectives. Send for Bulletin A-145.

If interested in our complete line of quality school microscopes at low cost, send for bulletin M-80. Please address Dept. NM

TESTA MANUFACTURING CO.
10122 E. Rush St., El Monte, Calif.

BOOK MANUSCRIPTS CONSIDERED

by cooperative publisher who offers authors early publication, higher royalty, national distribution, and beautifully designed books. All subjects welcomed. Write or send your MS directly.
GREENWICH BOOK PUBLISHERS
Attn. Mr. Gordon 489 Fifth Avenue
New York 17, N. Y.

An authentic, factual book for junior skin divers

DIVING FOR SCIENCE

By By Lynn Poole
192 pages, 5-3/8 x 8,
Only $2.75

Here is a different book on diving—one which not only discusses diving for individual information and fun, but also diving as an important type of scientific research.

The book discusses the very latest findings in the fields of underwater mineral and oil deposits, exploration of sea caves and caverns, charting of fish migration and fish feeding, utilization of ocean products as food and in manufacture, and salvage of long-lost sunken treasure.

DIVING FOR SCIENCE contains fascinating sections about the work of underwater scientists at the Scripps Institution of Oceanography in La Jolla, California, the Woods Hole Oceanographic Institute, the University of Miami, and the Chesapeake Bay Institute of Johns Hopkins University.

SEND FOR YOUR COPY TODAY
AMERICAN NATURE ASSOCIATION
1214 - 16th St., N.W., Washington 6, D.C.

Reviews

Insect Friends

By Edwin Way Teale. New York. 1955. Dodd, Mead and Company. 96 pages. Photographic illustration by the author. $3.00.

Frequently we receive requests from school boys and girls asking, "Please send us everything there is about bad insects." Now and then the inquiry is for "everything" about the beneficial insects. Neither request is, of course, possible of more than partial fulfillment, nor is the line of demarcation between the injurious and beneficial insects as sharp as our young inquirers—and their teachers—appear to believe. We can now refer some of them to an excellent text on the "good" insects, as presented in Edwin Teale's *Insect Friends*. This attractive book, illustrated with some of the best of Mr. Teale's splendid insect pictures, is prepared for an audience of boys and girls in the eight-to-fourteen age bracket. So far as we know this is the first book Mr. Teale has written for such an audience, and he has succeeded admirably. Among the friends presented in text and picture are honeybee, bumblebee, ladybird beetle, praying mantis, dragonfly, damselfly, robber fly, crane fly, lacewing fly, monarch butterfly, black swallowtail, polyphemus moth, luna moth, cecropia moth, firefly, May beetle, froghopper, water strider, cicada, tree cricket, field cricket, katydid, grasshopper, ant, daddy longlegs, lantern fly, lace bug, and some minute insects. R.W.W.

Our Daily Poison

By Leonard Wickenden. New York. 1955. Devin-Adair Company. 178 pages. $3.00.

"Most of us," says the author in a foreword, "have become uneasily aware, in recent years, that we are living in a poisoned world. Pesticides are sprayed over the fruit and vegetables that we eat; we cannot buy beef or poultry with any assurance that the meat is free from hormones that may produce profound changes in our bodies; the flour used in making our bread is 'aged' with chemicals and doctored in other ways; the air we breathe in hotels and public halls is impregnated with poisoned vapors; in more and more of our cities, a noxious chemical is being added to our drinking water; cosmetics are on the market which may bring lasting injury to the users."

The author of this book is a noted chemist and fellow of the American Institute of Chemists. In gathering the material for it he has studied and evaluated a vast amount of published material—testimony, medical and scientific journals, Government bulletins and other data. The result is a valuable but frightening book. Says Dr. Wickenden: "If you prefer the temporary bliss of ignorance, let it alone."

The current mania for poisons in the form of insecticides, fungicides, weedicides, fluorides and many other lethal chemicals is incomprehensible, on sober thought. The general acceptance of these poisons by doctors, horticultural and Government scientists and others is equally difficult to understand. If we were a young doctor today, seeking a lucrative specialty, we would concentrate on the diagnosis and treatment of ailments induced by chemical poisons, and could look forward to a growing practice and as many high-powered automobiles as is the pleasure of the specialist in stomach ulcers.

The scant evidence, for example, upon which fluorides have been accepted, and foisted upon the public through its drinking water, is an amazing example of this trend. The residual toxic properties of insecticides and weedicides, and their effects on humans, have been largely ignored. All these and other phases of this current craze are objectively and importantly presented in this book, which, we trust will receive serious and widespread reading.

R.W.W.

Hunting the Lawless

By Hugh M. Worcester. Berkeley 2, California. 1955. American Wildlife Associates. 298 pages. Illustrated. $5.00.

For more than thirty years Hugh M. Worcester was engaged in enforcement of the laws governing wildlife in the States of Idaho and Washington, and for the United States Fish and Wildlife Service. This is no sedentary occupation but a duty that is often perilous and calls for ingenuity, courage and intelligence in its performance. The law enforcement officer was and, still is, on the side opposite the gangster, the game hog, the market hunter and others who hold our game laws lightly. These are the lawless about which Hugh Worcester writes in what proves to be a book of both adventure and detective work. The story of the infamous Los Banos case, centering about this Merced County community, a hot spot of violation in California, makes interesting, exciting and alarming reading. Much of the author's work concerned migratory waterfowl, but he points out that this is natural "because the commerical killing, or market hunting, of such waterfowl—especially ducks—is far more extensive and devastating than that of any other species of wildlife, including fish." But enforcement work carried Hugh Worcester into other wildlife areas as well. We hope that his report on all this will receive the wide attention that his enlightening book eminently deserves.

The Windward Road

By Archie Carr. New York. 1956. Alfred A. Knopf. 258 pages, and index. Illustrated. $4.50.

When the American Institute of Biological Sciences met at the University of Florida the principal speech at a general evening meeting was listed as "The Passing of the Fleet" by Archie Carr. It was a provocative title, and most of the audience, including ourselves, wondered just what it would comprise. We were not disappointed for Professor Carr talked of the green turtle and the fate it has suffered at the hand of man in its rapidly contracting Caribbean haunts. This paper provides the concluding chapter of *The Windward Road*, and we have enjoyed reading it as we did hearing it.

The opening chapter of the book is "The Riddle of the Ridley," the name given to a sea turtle whose habits of life are indeed a riddle. Through the other chapters of this fascinating and beautifully written story of a naturalist adventuring on remote Caribbean shores runs the thread of the search for the answer to the riddle. Along with this and the natural history, particularly the herpetology, of these shores goes the story of places and people. Archie Carr stands in the front rank of naturalist-writers. He takes the reader with him, makes him feel the sun on his back, enjoy the warmth of the breezes, see the pageant of the clouds, loll in a hammock with him in the shade. If you do not travel the Windward Road with Archie Carr you have missed something.

R.W.W.

Contents noted BY THE EDITOR

WILDLIFE AND OIL DO NOT MIX, asserted some conservationists upon announcement of a new Department of Interior code with respect to opening refuges in the National Wildlife Refuge System to oil and gas leasing. Quite a ruckus was stirred up by this development, investigation of which leaves one with mixed emotions. Certain refuge areas were originally acquired with oil and gas rights reserved and these are not affected by the recent rulings. Conditions surrounding leases on other areas were in a somewhat chaotic condition, and, basically, the recent order was designed to bring order out of this chaos. In connection with it certain refuges are completely closed to any leases, others are open to lease under certain specific stipulations, with the U.S. Fish and Wildlife Service having the right of veto. This last circumstance is the strongest argument for the regulations. One unfortunate, and inevitable, result of the code has been to stimulate the filing of applications for oil and gas leases. The Service has the right to reclassify areas and place them in the completely protected category, and we understand that this is being done, following an unfortunately too hurried original classification. We agree that oil and wildlife do not mix, and we feel that our needs for sources of oil are not so serious as to endanger our wildlife refuge system. We are confident, however, that the Fish and Wildlife Service will consider the wildlife resource as of paramount concern, and approve applications only where wildlife will not be affected. Operation of this code, however, will be closely watched by conservationists aware of the perils of oil development on refuge areas.

BOY SCOUT WORK IN CONSERVATION really got into high gear with the National Conservation Good Turn program, launched so successfully in 1954. Now continuance of this activity is greatly encouraged by a grant to the National Council of the Boy Scouts of America from the Rockefeller Foundation. This grant of $50,000 is toward support of a five-year program in conservation education. Ted S. Pettit, who headed the 1954 project, has been named to direct the expanded effort. He says that emphasis will be placed on boy projects at the local level. Through these the Scouts will learn desired conservation attitudes while they practice good conservation methods. Special materials will be issued to further activities with respect to forest, soil, water, fish and wildlife management. This encouragement by the Rockefeller Foundation is a down-to-earth, practical recognition of the fact that it is as important to train the conservationist of tomorrow as it is to try to educate the conservationist of today.

IGNORANCE IS DIFFICULT TO OVERCOME. Just when one thinks progress is being made, along comes a featured picture and story such as that in the *Kansas City Times* for January 11, 1956. A three-column picture shows a barbed wire fence festooned with the carcasses of some fifteen hawks of unidentifiable species. With the dead birds stand a large boy and his father, both armed with rifles. The story says:

"The dead birds, mostly chicken hawks, are the result of a high school project for vocational agriculture students at the Tonganoxie high school. And they were shot by Gary Gwinn, 15, son of Mr. and Mrs. D. W. Gwinn. Gary embarked upon a hawk-shooting career when he enrolled in the 'pest contest' in order to win points for his Future Farmers of America activities. He gets twenty-five points for every dead hawk and he just loves to shoot them. It not only brings his points up, but it protects the family chicken flocks. . ."

Gary's score had been run up to eighty-five hawks when this story was written. It does not appear that any distinction as to species was considered, assuming that the boy knew one hawk from the other, and many beneficial hawks have doubtless fallen to his gun. But more disturbing than one boy's misapplied energy is the fact that the high school encourages such an activity, and that the Future Farmers of America organization stimulates it.

PREDATOR CONTROL—WHY AND HOW is a booklet that young Gary Gwinn might read with profit not only to himself but to the farm he mistakenly thinks he is aiding by his personal hawk vendetta. This booklet has recently been published by the Missouri Conservation Commission and is the work of W. O. Nagel, Frank W. Sampson and Allen Brohn of that Commission. It seems to us to be one of the most effective popular discussions of predators and predation ever brought out. An indication of its approach may be found in the first sentence of the booklet: "A predator is any creature that has beaten you to another creature you wanted for yourself." This, it is pointed out, is the personal view and the truth, but not the whole truth. We cannot detail here the excellent objective and subjective discussion to be found in this bulletin. In Missouri it is available free, elsewhere it is twenty-five cents a copy from the Missouri Conservation Commission, Monroe Building, Jefferson City, Missouri. R.W.W

MOUNT OLYMPUS FROM HURRICANE RIDGE — PHOTOGRAPH BY DEVEREUX BUTCHER

ASSAULT UPON OLYMPUS

By Bessie Berg

Majestic crest, Olympus! Ocean mist,
Thunderheads, Pacific storm and drift
Of winter sleet sweep round you. Still you lift
Your time-enduring crown above them. Kissed
By gentler wind, and bathed in winter sun
All your god-like glory gleams
In kingly loneliness. Then April streams
Warm upon your frozen fastness. Won
At last, the Titan-struggle from the cold
Sheath of winter! Rugged slopes emerge,
Thrilling green, flower-decked to urge
Antlered elk to seek far heights by old
Well-worn trails; the rendezvous with Spring!
Mystery-strange rain-forest, shadowed deep
In dew-heavy boughs, low-bent, that sweep
Earth fragrantly for innocent wild things'

Retreat! Ageless sanctuary, free
From fire, baptized by Nature's hand;
Malignant greed, stalking the land
Seeks to despoil this refuge where may flee
The hard-pursued, swift-footed wild
Remnant of the primitive — free child
Of an unravaged wilderness that used to be!

Stephens whip-poor-will, the drowsy "night moth," upon her "nestless" eggs is found at oak-yellow pine borders high in the Chiricahuas of southeastern Arizona.

The whip-poor-will of the West is a

Will-o-the-Wisp of the Border Hills

By JOHN LINDSEY BLACKFORD

Photographs by the Author

VIOLET dusk welled from the dimming grassland floor of Sulphur Springs Valley. It seeped upward through the little oaks of the outwash slopes of the Dragoons; then gathered into purple night in the Stronghold of Cochise. If the famed Apache war chief and his braves still lingered there in his favorite mountain retreat, they were as wraith-like as the panther-black shadows of the ghostly hills. Now the sparkle-dust of stars was thickly strewn above the treetops. Only the fluttering of a wild pigeon on its roost rippled the deep silence of the night canyon. I was alone at the campground of the warriors.

Imperceptibly, as though at first transmitted on a wave-length to which my senses were untuned, the spell of the hushed dark was broken. Then, abruptly, I became aware of a new, and presently clamorous night voice. Far out in bordering oaks and mixed scrub of the low alluvial apron slanting away from the hills, almost to the desert grasslands, a mysterious singer was echoing his nuptial notes. Nearer, and on either hand, two answering mystics repeated the syllabled calls. Close along the dry, boulder-bedded streamlet descending from the canyon ravine, another added to the boisterous chorus. The nearer notes were strangely harsh; the others softly subdued by distance.

Suddenly I knew. I was listening to my first whip-poor-wills! For the western bird, a larger form of the eastern night-caller, comes only into the border mountains of our desert Southwest.

As ardor mounted, the competing calls of these phantom fly-hawks of the foothill dark joined into a continuous, bewitching love-medley of the warm, sensuous Arizona night. Unknowing, I was being introduced to one of the deeper bird mysteries of western wonderlands. Again next evening, there in the alluring Dragoons, their eerie, whipping whistling wrapped the woodlands in a lulling monody of musical delight.

With their elusive haunts and habits, I understood why these vocal, feathered "night moths" have won so strange and notable a role in superstition. They were the most vociferous visitations of a primitive's fear-filled night! Today, when we hold in hand one of these feathered performers, the frail form appears incapable of the loud, wild, interminable renditions we have heard. And the dusky, mottled plumage seems almost to bear the dusty, crystalline wing-bloom of fragile, night-flying moths.

It was two days later, June 4, 1946, eastward across the great valley plain, while back-packing in the historic Chiricahuas. Descending steep rocky ledges, on the forested side of a small upper canyon, three miles from Massai Point, I was startled at about nine in the morning

to hear a whip-poor-will call. The outcry arose below, in the understory near the bottom of the ravine. The notes, given but once, were unusually harsh. Not the full call of *whip-pur'r-will* that had first stirred my consciousness three evenings before. Yet they halted me abruptly. They were unmistakable!

Why had this nocturnal will-o-the-wisp shouted forth so roughly in the sunny daytime? His was properly the disembodied spirit-voice of the starry dark and the crepuscular light.

My ears, already sharpened by frequent tail-buzzing of lurking green rock-rattlers, were now keenly alerted. But they caught no further sound. Only the sweet-breathed breeze caressed the needle-plumes of the tall Arizona yellow pines. The ravine live oaks beneath them barely stirred.

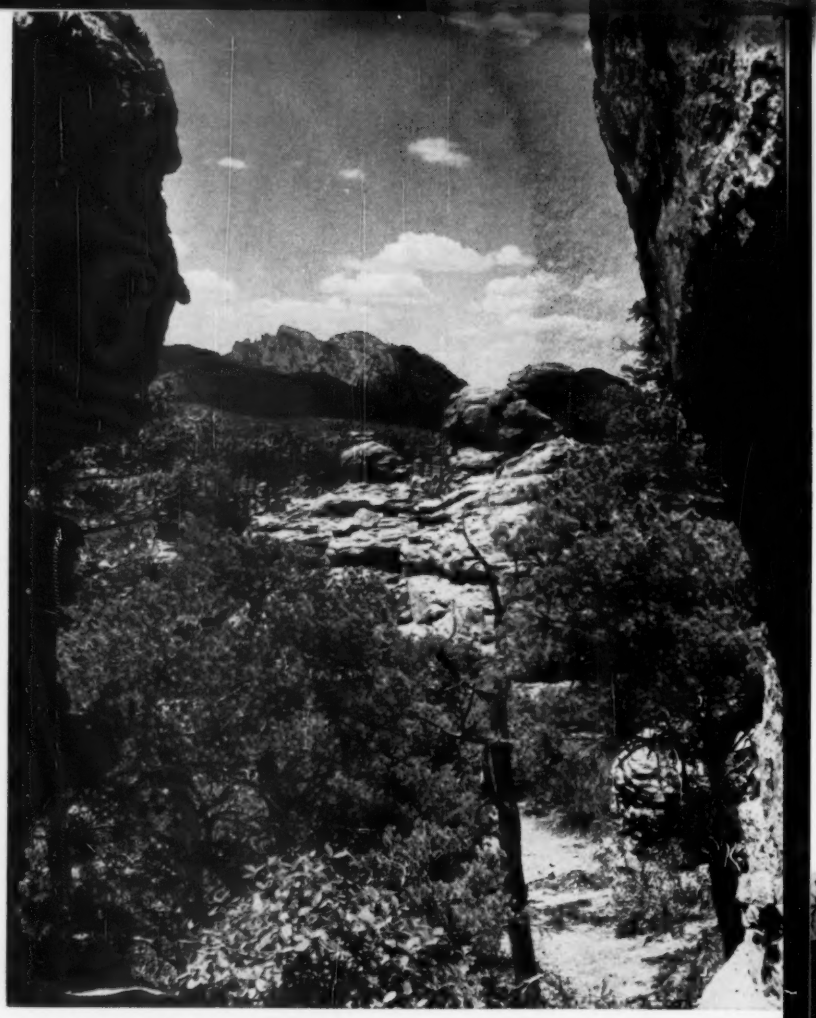
Examining the ground carefully about the borders of the undercover, I dropped slowly down across a stony, grass-tufted slope; then followed along an outcropping level ledge. Quickly a brooding bird of the goatsucker family flushed from its nest and eggs. She barely alighted on bent, downhill shrubbery; and half-decoying, fluttered away into denser brush. It was evident now. The daylight call from cover had been the warning of the male whip-poor-will to his mate.

With the camera's eye accurately focused, it peered intently at the unmade "nest." Two eggs lay on dry oak-leaf; pine-needle forest-floor litter carpeting a narrow, rocky shelf that interrupted here the lichen-grown canyon wall not far above the dry rivulet of the ravine. The picture secured, I picked up each oval and examined it closely, noting that each was a rather lusterless, unmarked white, save for slight earth-smudges where it had rested upon the ground. Then I left, not knowing that their coloration constituted any scientific mystery.

The nesting ledge was located at the oak-pine border, upper limits of the Upper Sonoran Zone. No other glimpse of the bird was then obtained. No other call was given.

On the second morning after, fresh coolness of dawn lent its blessing to the northern ravine. I eased a heavy pack from unenthusiastic shoulders, and with relief dropped a repellent-daubed handkerchief from before my eyes. No vicious midge-flies harried the hiker in this fortunate cove.

Today the flash outfit accompanied the camera. On the previous occasion a shaft of early morning sunshine had found the nest, a hand-sized patch of golden light falling directly upon the eggs. But the sun would swing behind the ravine wall for the rest of the day. Even at dawn a rock abutment and the canyon oaks and pines kept the site in almost constant shade.



Cochise Head in the Chiricahua Mountains of southeastern Arizona, as seen from Heart of Rocks. The great, dome-like mountain is named for the famed Apache war chief.

Circling the jointed, rocky wall I came down once more from above, prepared to make certain identification as between Stephen's whip-poor-will and the similarly vocal poor-will. Both are gray-brown-blackish, ground-nesting, night foragers whose uncertain habits are little known to naturalists. Yet there would be the variation in size; the different and identifying outer tail feather markings; and the color pattern upon the wide-mouthed head.

Slipping down the steep-pitched ridge I expected to find the bird upon her nestless eggs, her back toward my hillside trail. Again she was there. Cautiously around a mossy corner above, then from a few paces away, I studied the dozing "night moth," circled now in the luminous brilliance of binoculars. Often she partially opened soft sloe eyes and seemed ready to take flight; but stillness and quiet caused her sleepily to close them again. Undoubtedly there were the broad black and tawny-gray markings of the upper parts. And just visible, the "*outer tail feathers tipped with buffy or pale clay color.*" This was indeed the female Stephens whip-

poor-will. This was the little enchantress for whom her vociferous mate keeps the romantic night canyons of the border Southwest ringing from late April to September! Here in life was the retiring partner of that celebrated, seldom-seen will-o-the-wisp, whom later I came to know more intimately from Herbert Brandt's absorbing *Arizona and Its Birdlife*, and from his colorful letters, as "that persistently noisy bird of darkness."

Finally, on stepping close, the whip-poor-will flushed swiftly. During the remainder of the day, until mid-afternoon, giving her intervals to warm the precious ovals, I strove for portraits of the dusky inspiration of that highland night voice. The camera clung tenaciously to the earthy, outer slope of the shelf. But the pull-cord took off into space so that it required looping over a downhill branch and back within reach to the ledge below. At last I stole to the opposite slope of the ravine. With field glasses peering between intervening treetrunks, from farther away than might have been spanned by a towering pine fallen across depths of the draw, I hoped to discover the wary covering of those distant two white dots.

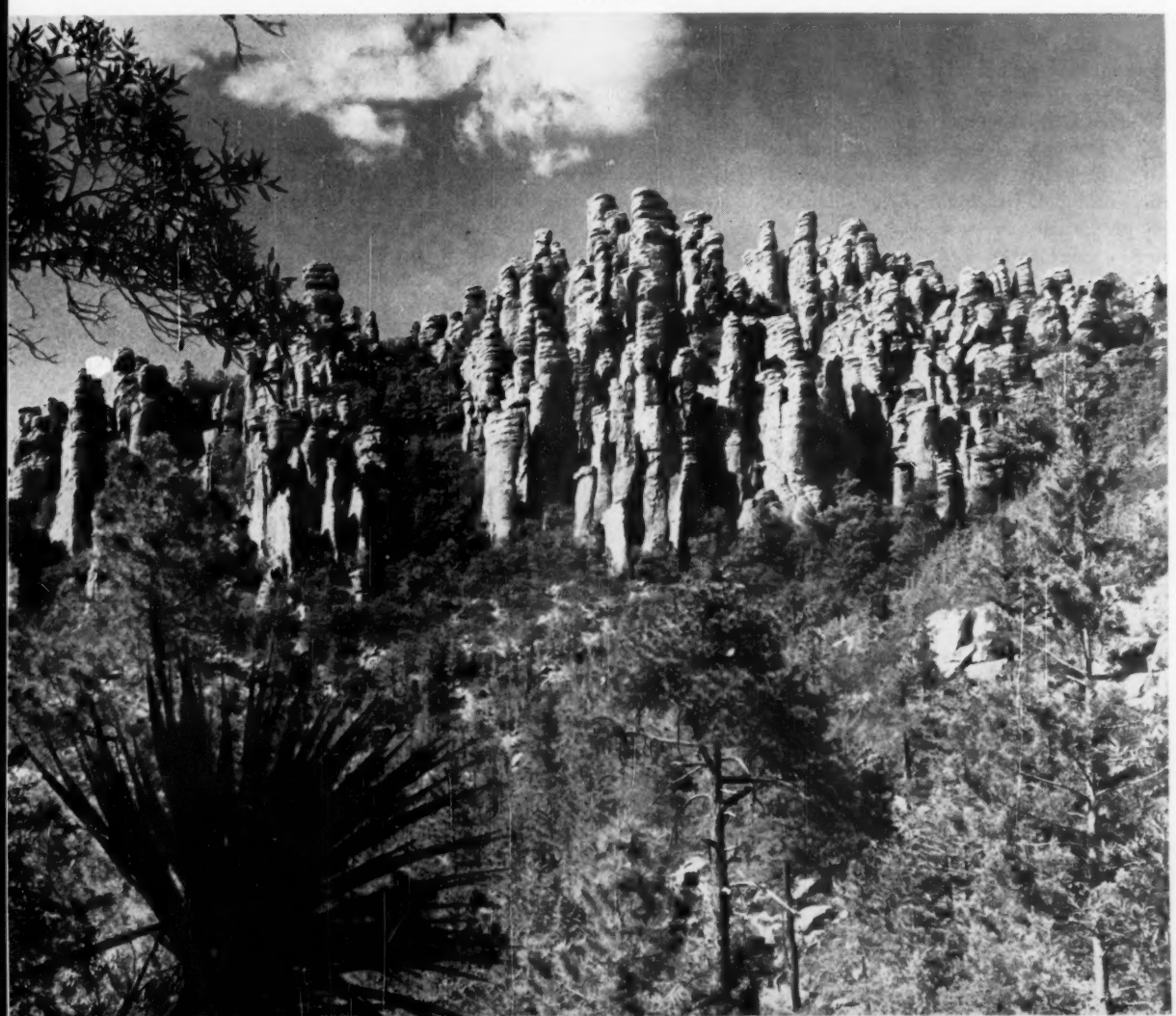
A half-hour passed, while white cloud ships resolved from the mountain blue and rode rocking out over the dazzling desert leagues below. Then searching glasses told of unbroken shadow on the shelf. The pinpoints of white had vanished. I climbed the rocky stairs, slipped past a sheltering abutment to glimpse the brooding whip-poor-will, and drew the trip-cord tight. It failed.

Again I flushed the sitting bird, restrung the obstinate thread, and waited. The magnetic pull of those two featureless eggs, and her own unfailing courage, brought the strange charmer of the dusk to their rescue. She regularly persisted in taking the same position upon the nest; sleepily refused to shift position at my near approach; and then, on silent owl-like wings, fled quickly. It was a lonesome vigil. No more was heard or seen of the male whip-poor-will.

As afternoon heat crisped the mingled oak leaves and fragrant, fallen pine needles on the cliffside nest-ledge, I left her, gazing back through the glasses to learn that she had reclaimed her rightful treasures.

Returning down the ravine, I was unaware that the four exposures in the film magazine were likely the first—may yet be the only photographs—of Stephens whip-

Turrets and towers of Chiricahua's Wonderland of Rocks as seen from the upper oak and pine belt, typical habitat of Stephens whip-poor-will.



Mingled oak leaves and fragrant, fallen pine needles of a lichened cliff-ledge hold the mysterious eggs of the Southwest's noisy night-caller, the Stephens whip-poor-will.

poor-will that have been secured of the living bird within our borders. Nor did I realize that, since Frank Stephens collected a single egg and its owner seventy-five years ago, and William Brewster named the southwestern race for him, there had been only eight other published nest records. This was so, although assiduous search had been made by many experienced field men seeking to complete the life history of the secretive serenader of the desert hills.

"Some of these nests that were found may have contained the eggs of the poor-will, which of course are pale cream-colored," Dr. Brandt informed me. "This is because these two nightjars are frequently confused in life by the outdoor workers." And: ". . . there seems to be a controversy as to whether or not they (the eggs of Stephens whip-poor-will) are somewhat mottled with lilac and other shades, or are flat white, or like the poor-will's, which has a creamy-brown color." Thus, as lately indicated by a famous field ornithologist, the egg color and shell markings of a common and intriguing native bird have not been wholly resolved after three-quarters of a century.

Next day the car rolled over Onion Saddle down into Cave Creek of the "Chiricows." Bare-branched April stream borders of four years before were now lushly verdant. In the deep valley, of evenings, whip-poor-wills decorated the blue canyon dusk with vibrant song.

Then it was midnight. Moonbeams flooded the streamside with shifting lakes of quicksilver. Ghostly white boles of sycamores shone in graceful distortion among black, somber oaks, their great umbrella leaves greenly pale and translucent in the moon-glow. I was a lone camper there below the South Fork. A shouted night-song near at hand was slowly prying me into wakefulness.

For long, without pause, it lashed the luminous, eerie silence: *whip-pur'r-will'*, *whip-pur'r-will'*, *whip-pur'r-will'*, *whip-pur'r-will'*. So close that over-arching arms of the nearest live oak seemed to hold the secret.

Moon-radiance stippled and shadowed the lichened cliff-wall that buttressed the mountain side hardly a leaf's fall away. It silver-dusted the pale, dappled sycamore trunks. It poured over the bouldered streambed.

I slipped noiselessly out into the moon-blotched enchantment of the yucca-studded oak aisles. The serenade ceased abruptly. Then continued again, away in the canyon-floor forest beneath the towering crags of the Canyon of Color.

The night-caller's notes verged upon the discordant when near in the oak-sycamore forest. Yet softer, subdued, narcotic when distant in the canyon. Irresistibly I fell asleep, drugged into drowsiness by this magic.

DUSK ON THE DESERT

The desert shows
The pearly blues,
The mauve and rose
Of seashell hues.

Though no tides lave
This sere retreat
Save wave on wave
Of shimmering heat,

An opal haze
Like mist lies fanned
In pinks and grays
On a sea of sand.

Ethel Jacobson

Mrs. George A. Smith, Dr. Gilbert Grosvenor of the National Geographic Society and Mrs. Grosvenor, and R. P. Allen of the National Audubon Society staff take a boat trip in Lettuce Lake on the Corkscrew Swamp sanctuary.

Great cypress trees and rare animals saved for tomorrow in

CORKSCREW SANCTUARY

By ANNE LABASTILLE

Photographs by Allan D. Cruickshank from National Audubon Society

It was called Big Cypress Swamp, and few swamps were ever as vast and wild, or more unknown and mysterious. Located in the remotest part of Florida, seldom visited save by Indians and hunters, its 2400 square miles of trackless timber contained billions of board feet of valuable cypress wood and rare and beautiful animals. They were valuable and rare because they were the last; the last in Florida. And here was the last such assemblage of animals and plants in the world.

Here, before the white man's invasion a few decades ago, drowsed a world so strange and lovely as to seem wholly exotic to our America. Beneath the towering bald cypress and scarcer, smaller pond cypress, both silvery-gray, hung with Spanish moss, and buttressed against the howling hurricanes by their massive, flaring trunks and surrounding "knees," the swamp water stood—sweet, cool, and brown. "Sweet" because it had seeped its way southward from the great Lake Okeechobee through clean, green saw-grass and porous limestone; cool in the dim light filtered through feathery cypress needles and shrouding moss; "brown" from tannic acid, rich muck, and centuries of decaying vegetation. The roosting wood and white ibis momentarily marred the serenity of this land; swallow-tailed kites and the shadows of red-shouldered hawks sped across it. An alligator slithered noiselessly through the water with scarcely a ripple, while the cottonmouth moccasin caused more disturbance with its sinuous swimming. From low branches were mirrored dainty spider and ghost orchids and the flamboyant flowers of epiphytic

John H. Baker, President of the National Audubon Society, stands by one of the giant cypress trees.

Hank Bennett, Audubon warden who lives in a comfortable cabin on the sanctuary's edge, wades in Lettuce Lake.

bromeliads. In the sluggish water itself, grew swamp lilies, arrow-heads, bladderworts, and duckweed on which clung the pomacea snails, favorite food of the elusive limpkin. Along the banks, wildcats and panthers prowled, scenting out the round-tailed muskrats and marsh rabbits. Black bears ambled along, looking for occasional cabbage palmettos with their tasty centers. Opossums and raccoons froze suddenly in their tracks as the low call of a barred owl surprised them. This, then, was the life of Big Cypress Swamp—primitive, fascinating, and unique. It was an ecological unit with no duplicate the world over, its fauna and flora peculiar to Florida and those few square miles of swamp.

Any area with a wealth of natural resources is constantly faced with the threat of exploitation, and Big Cypress is no exception. Loggers and hunters have taken a heavy toll. The cypresses themselves are prized as the "wood eternal" because of their decay-resisting qualities. As if living up to their name in another way, it takes cypresses an eternity to grow. Thirty years sees but a scant inch of new wood added. Some 150-foot giants are estimated at being 3000 years old. In Sanford, Florida, one such venerable cypress, "The Senator," still stands. It is carefully guarded by a high fence in a public park where thousands of visitors come each year to see it. Harmless increment borings through the bark to the very center show this tree to be about 3500 years old. This feature, then, makes the trees even more valuable since a new crop may take a thousand years to mature.

Inroads made by lumbering companies have depleted the choice cypress until today there is only an estimated three billion board feet, or enough for 375,000 average American homes, left in Big Cypress out of the eight billion remaining in the entire United States. No sustained yield or forest management was practised on the crop. The motto had been strictly "Cut Out and Get Out." And to see Big Cypress Swamp is to realize why this was done.

Bogs and deep water slow down construction of logging railroads to a creeping one mile per three months. Mosquitoes, alligators, moccasins and mud tax loggers' nerves. Heavy equipment such as skidders and trains may sink out of sight in the morass. It takes time, skill, and courage to fell a tree seven feet in diameter, a giant that may topple over with one swing of an axe due to peck fungus infection, which produces the attractive grooves and borings prized in expensive "pecky cypress" woodwork. This makes it a job where the loggers' one thought is to "get the wood out and get ourselves out." It just is not feasible to log on a sustained yield basis. So the destructive cutting has gone steadily on.

In 1913, an all-time high of one billion board feet of cypress were harvested, and today our annual demand is 283 million board feet. Many special uses are made of this lumber, such as expensive panelling for rooms, sturdy stadium seats, sound caskets, and vats for pickles and beer. When the virgin stands are gone, there will be no more cypress for a long, long time and maybe never. Growing new trees is difficult since poor seed

dispersal, standing water, and fires defeat the struggling young seedlings.

The birds and other animals of Big Cypress Swamp also face a losing battle. Hunters of plumes once reduced the egret and ibis to a fraction of their former numbers, and the otter and deer did not escape traps and guns. The prime disgrace was the notorious plundering by the plume hunters half a century ago, when innumerable birds were killed so that fashionable ladies might wear plume-draped hats.

Although Federal and State laws were passed to prohibit the sale of plumes, as well as the slaughtering, the birds of Big Cypress recently faced another grave threat. Their need of a nesting site undisturbed by man and near adequate food caused the birds to choose Corkscrew Swamp for their rookery. There, in the very heart of Big Cypress virgin timber, around a horseshoe-shaped slough of saw-grass, wood ibis and American egrets from far and wide have nested for as long as white man has any record. Last year, cypress logging drew dangerously close to the rookery. In the face of a threat of combined loss of the birds' immemorial nesting site, as well as some of the finest virgin cypress left in the country, concentrated efforts were made to save this area. As the saws were rasping their way into the outermost rookery trees, last-minute action by alert conservationists stopped the logging as it was about to obliterate one of the last stands of primeval cypress, and perhaps the largest bird rookery of wood ibis and American egrets in the United States. In Okefenokee Swamp, in bits of Arkansas and Louisiana, and scattered remnants along the Gulf and Atlantic coasts are found the only other uncut stands of bald cypress.

The story of this conservation battle goes back a long way. Since those peak years of the plume-hunters' activities, the National Audubon Society has been concerned about the all-important rookery. During the years, the Society and Lee Tidewater Cypress Company, large-scale lumbering corporation in the area, have kept in touch. But when logging disaster threatened the Corkscrew region, it looked doubtful that funds could be raised in time to purchase this land.

Then staunch conservationists took the initiative. The Society, through its president, who served as chairman of a fund-raising committee, negotiated options, purchases and leases. Strong friends of conservation came to the rescue, some three hundred of them. Special mention should be made of generous contributions by John D. Rockefeller, Jr., through the Jackson Hole Preserve, Inc.; Paul Mellon, through Old Dominion Foundation; the Florida Federation of Garden Clubs; Radford Crane; Mr. and Mrs. Theodore M. Edison; the Nature Conservancy; Childs Frick, and the New York Zoological Society. In all, $170,000 were contributed

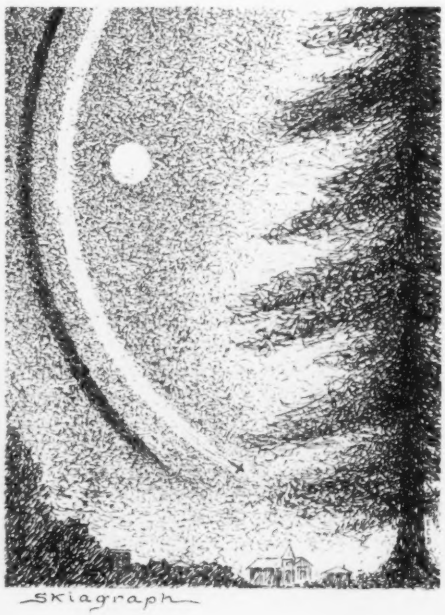
Bob Allen and Hank Bennett of the National Audubon Society stand at the edge of virgin pine looking at the cypress of the Corkscrew sanctuary in the distance.

for acquisition, $13,000 for initiation of a $100,000 maintenance fund, and some $14,000 for operating expenses. Eighty-one residents of Ft. Myers, Bonita Springs and Naples, Florida, chipped in some $3000 in response to the appeal of Bill Piper of the Everglades Wonder Gardens.

After the first purchase of 160 acres, the project expanded. Lee Tidewater gave 640 acres to National Audubon Society as a Christmas gift, and soon 2080 more acres were bought. A total of 5760 acres is now under Audubon administration, including 2880 acres that are leased from the Collier Enterprise. And that is the story of how this magnificent bit of America has been saved. It is valuable not only as another wilderness area, which, in the words of Aldo Leopold, "preserve for the edification of those who may one day wish to see, feel, or study the origins of their cultural inheritance . . ." but also as a buffer against further depredation upon the vanishing virgin timber and animal life.

An Audubon warden, Hank Bennett, with years of game-protection work behind him, is on the job. He lives at the edge of the sanctuary in a comfortable cabin and makes the rounds by jeep or on foot. It is rough going and not the kind of work for just anybody. It means living alone, miles from a neighbor; carrying a snake-kit at all times, just in case; wading up to the waist in sluggish swamp water. But it is a job that pays well in peace of mind and the satisfaction of doing a most important bit of work. Just as significant is the ecological study done by Robert P. Allen, Research Associate of the National Audubon Society, aided by Sandy Sprunt, to learn of all the forms of fauna and flora that are found in the sanctuary.

So another cross-section of our fast-diminishing natural resources has been placed in safe-keeping for all time to come. Another unique community of trees and birds has been preserved. A bit of that intangible but priceless gift—untouched Nature—has been left unmarred. Big Cypress Swamp no longer encompasses an untamed wilderness of thousands of square miles, but, rather, the few precious and magnificent acres of Corkscrew Swamp Sanctuary!



Skiagraph

By EDWARD C. DAY

THE FULL moon, encircled by a ring, shone through a veil of mist. Even so, the gray patches and bright areas on its surface were recognizable to one familiar with lunar topography.

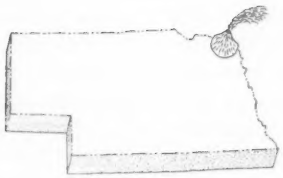
We had just come out of an amateur astronomy meeting and paused a moment to enjoy the scene, when a jet-plane in curving flight, described a silvery trail close beside the moon. A breeze in the upper air bore the luminous arc right across the lunar disk. One member of the group observed the transit through a telescope while the rest of us watched it with unaided eyes, so rapid was the movement of the vapor trail.

At the instant the trail reached the opposite side of the moon and encircled the orb in a graceful arc, a shadow of the bow appeared, paralleling and giving accent to its shining border. The bright trail and its dark counterpart was an unusual and beautiful spectacle, but trail and shadow soon dissolved and vanished from sight, leaving us to ponder on the way in which the skiagraph had been produced.

The Greek word skia means a shadow, and most students know what it means to make a graph. Here, then, was a shadow-graph in the sky. Evidently the pilot had flown his plane above the level of the mist. What to us was ceiling, to him was floor on which the moon projected a shadow of the relatively dense but luminous trail.

In the Epistle of James (1:17) occurs a phrase "tropes aposkiasma." From the first word (the e is pronounced like long a) we get our word tropic, the seasonal turning point of the sun; and in the second we discover skia as the nucleus of the longer term. The whole phrase means a "shadow cast by turning," and is appropriate here.

The interpreting of a celestial phenomenon is much like translating a passage from the Bible in Greek. In either case we need to get at the underlying meanings in order to understand.

Nebraska's  Volcano

By RICHARD L. THREET

NEBRASKA may have some of the nation's most extensive deposits of volcanic dust, blown into the Great Plains area from ancient eruptive centers of the Southwest. There is nothing in the tranquil geologic history of Nebraska, however, to indicate an actual volcano within the present State boundaries. Yet, up until about fifty years ago, various Indian legends, historical journals, and newspaper articles spoke fearfully of volcanic activity near the little pioneer village of Ionia in Dixon County, along the Missouri River bluffs in northeastern Nebraska.

Although early trappers and fur traders apparently mentioned the "burnt bluffs" of the Missouri River, one of the first written descriptions is found in the journals of the Lewis and Clark Expedition. Late in August, 1804, the expedition left the site of Sioux City, Iowa, and soon discovered "a burning bank or Bluff which was verry high & had fire in it . . . a Sulpheras Smell . . . a great quantity of asney (arsenic)," opposite the mouth of the "Smoky-Earth or White-Stone River (Vermillion River of South Dakota)." It was reported further that; "this Bluff Contained Alum, Copperas, Cobalt, Pyrites, Alum Rock, and Sand Stone. Capt. Lewis in proveing the quality of those minerals was Near poisoning himself by the fumes & tast of the *Cobalt* which had the appearance of Soft Isonglass. Copperas & alum is verry pisen . . . Capt. Lewis took a Dost of Salts to work off the effects of the arsenic."

The journals of Lewis and Clark indicate further that the expedition received a welcome from friendly Indians, who related old legends about the sacred "burning hill," which had been regarded with much superstitious fear. It was said that, long before the coming of the white man, the ancestors of the bloodthirsty Arapahoes used burning slopes of the sacred hill for human sacrificial rituals. At that time, legend says, the "burning hill" was much more extensive until the Great Manitou became angry; his voice had been heard like the roll of many thunders, and in his wrath he had crushed the bluffs into the earth.

Many western explorers and traders followed the route of Lewis and Clark up the Missouri River during the early part of the 19th century, and surely many of them saw and wondered about the "burning bluffs." It was not until 1839, however, that a proper explanation of the feature was given by the French geographer, Nicollet, who indicated that "these pseudo-volcanic phenomena may be compared with those described as occurring in other parts of the globe under the name of *terrains ardens*, although they are not here accompanied by the emission of flames. They are evidently due to the

Vertical aerial photograph of the "Ionia Volcano" as it appears at present, along the Missouri River bluffs in northeastern Nebraska. Curved lines of vegetation in the bottomlands outline former courses of the river, when it figured in repeated undermining of the bluffs and activation of the "volcano," about seventy years ago.

PHOTO COURTESY OF CONSERVATION AND STABILIZATION SERVICE, U. S. DEPT. OF AGRICULTURE.

decomposition, by the percolation of atmospheric waters to them, of beds of pyrite, which, reacting on the combustible materials, such as lignites and other substances of a vegetable nature in their vicinity, give rise to spontaneous combustion, while further reactions—well understood by the chemist—upon the lime contained in the clay bed, produce the masses and crystals of selenite that are observed in the lower portion of this interesting deposit."

But the rather obscure journals of Nicollet were generally unknown among pioneer Nebraskans, whose chief concern was with civil strife and problems of existence in a rigorous, new environment. Less scientific observations and speculations by local people soon grew into fears of disastrous volcanic activity.

During the 1860's and 1870's, the "Ionia Volcano" attracted much attention, especially with its repeated activity following the frequent floods on the Missouri River. Steam and sulphurous fumes issued from cracks in the hillside, and the heated earth ignited lumber thrown on the slopes of the bluff. The fears of local inhabitants reached a peak on November 15, 1877, when northeastern Nebraska was shaken by an earthquake, which was thought to be related to an impending eruption of the "volcano." "If that is so, it is time to go about family worship!" observed one newspaper.

Disaster finally did strike—early in 1878. A raging flood of the Missouri River undermined the bluffs and caused a large section of the "volcano" to slide into the river. The hungry waters swept on downstream to wipe out most of the little village of Ionia, located at the base of the bluffs. The surviving families later moved up on the bluffs, to escape the gnawing waters of the river, and they no longer paid much attention to the enervated "volcano," except during its occasional, feeble exhalations.

When E. H. Barbour came to Nebraska in 1893, as the first State Geologist and Professor of Geology at the University, the mystery of the "Ionia Volcano" was finally dispelled by a restatement of Nicollet's theory of chemical heat due to decomposition of pyrite, or iron sulphide. By 1907 the struggling settlement of Ionia had declined to the point where it was discontinued as a post office station, and the stories of "Nebraska's Volcano," likewise, were drifting into obscurity. A newspaper photographer attempted to rekindle temporary interest in the "volcano" by building a bonfire on top of the bluffs and photographing the "eruption," but no one was taken in by the hoax. The "Ionia Volcano" and its spectacular history continued to fade away during the following decades, until hardly anyone of the present generation has even heard of the burning bluff that terrified and mystified pioneer Nebraskans.

In 1954, the author and a group of his geology students made a field trip to northeastern Nebraska, in order to follow up the story of the "Ionia Volcano." Only a neglected cemetery and the crumbling foundation of a school mark the former site of Ionia. A few hundred yards westward along the bluffs, the "volcano" is now no more than a landslide-scarred hillside, and cultivated bottomland stretches out from its base, where the turbulent waters of the Missouri River once flowed. The faint odor of sulphurous fumes, encrustations of alum and Epsom salts, and abundant transparent crystals of selenite gypsum (the "Cobalt" and "Soft Isonglass" of the Lewis and Clark journals) are mute evidence of the once-violent chemical activity that took place as repeated landsliding brought fresh pyrite to the surface.

A careful study of maps and aerial photographs of the area permits accurate reconstruction of the geological events during which a meander loop of the river channel shifted to and beyond Ionia, temporarily undermining the bluffs and causing landslides. Natural levees covered with willows and scrub timber trace successive courses of the shifting river, as it trimmed the bluffs to a neat, straight line. But the geological story alone is disappointingly drab and incomplete, without the colorful legends and history of the "Ionia Volcano."

Let's Go Rock-Hounding

By MABEL IRENE HUGGINS

EVERYONE knows about "a rolling stone." Certainly, "it gathers no moss." Not too much geological knowledge was needed for that one. How about some others? Can you identify the following? See page 164.

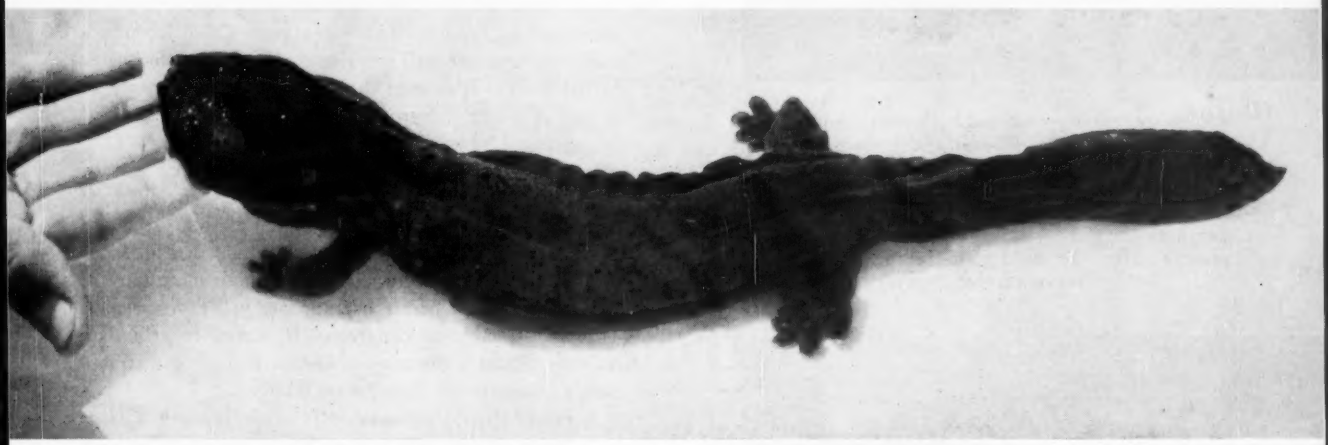
1. .....stone; a citrus fruit.
2. .....stone; a valuable metal.
3. .....stone; a heavenly body.
4. .....stone; a river in Germany.
5. .....stone; a cleaning material.
6. .....stone; sharpen by rubbing.
7. .....stone; a vital fluid.
8. .....stone; mend shoes.
9. .....stone; the edge.
10. .....stone; a head covering.
11. .....stone; the Stars and Stripes
12. .....stone; bile.
13. .....stone; a boy's nickname.
14. .....stone; gritty particles.
15. .....stone; the fireside.
16. .....stone; burden.
17. .....stone; a measure of distance.
18. .....stone; an insect.

Mr. Repugnant of the amphibian world is

THE HELLBENDER

By C. J. STINE and J. A. FOWLER

Photographs by the Authors



Taking a chance on being bitten, Mr. Fowler lifts the head of a hellbender from the water better to show the flattened structure that serves the animal so well in prying beneath rocks in quest of food. The specimen depicted is seventeen inches, but occasionally they are truly goliaths among salamanders, reaching a length of twenty-seven inches.

Of the eighty-eight species of salamanders that occur in North America, the hellbender, *Cryptobranchus alleganiensis*, has a threefold claim to distinction. It is one of the largest salamanders, it is most ancient, and it is unquestionably the ugliest.

Dwelling in flowing water, the hellbender is found over most of the eastern United States in the Susquehanna, Ohio, Allegheny and Mississippi rivers and many of their tributaries.

Students of reptiles and amphibians recognize a different race, known as Ozark hellbenders, occurring in the White and Black river systems of Missouri and Arkansas. They are the same as the parent form except for minute differences.

The source of the name hellbender is shrouded by a cloak of time, but whatever its origin it is most fitting. With its dwarfed, human-like hands, sinister beady eyes and wrinkled body one could imagine it swimming ominously in the river Styx. A "bender" it is, indeed, for when captured it thrashes violently, exuding a sticky, milky fluid from its skin while attempting to escape capture.

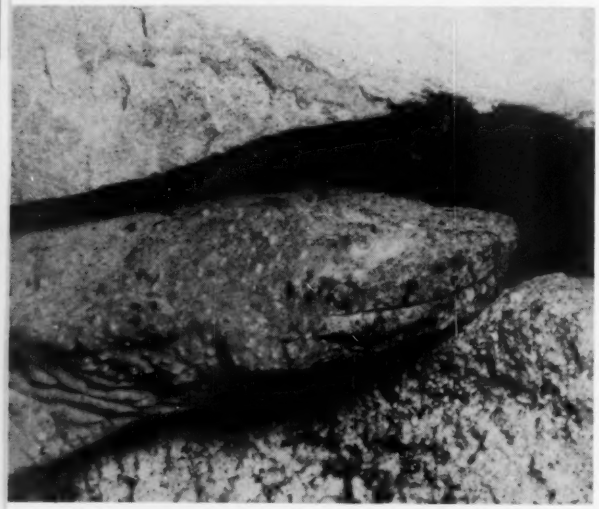
The hellbender is exceeded in size only by the Congo eel and siren, salamanders of our Eastern States, and the giant salamander, a close relative inhabiting China and Japan. Adults average seventeen inches, but old individuals may reach an extreme of twenty-seven inches.

A flat and flabby, mud-colored creature, the "alligator," as it is often locally called, has fleshy folds along the sides of the body, part of the tail and in back of the legs. The head is broad and compressed, made to order for exploring beneath large rocks. The mouth is large, extending well beyond the tiny eyes on either side. There are a series of two rows of teeth in the upper jaw and one row in the lower. With these the hellbender can inflict a mild—but non-poisonous—wound on its would be captor.

On the sides of the throat there are two slits, protected by folds of skin, called gill slits. The gill slits indicate that *Cryptobranchus* is of ancient lineage and more closely related to fishes than are other salamanders. For this reason the hellbender is relegated to a low position on the ladder of amphibian evolution. The gill slits are of little service to the hellbender since it has well-developed lungs.

Because it is a perennially aquatic, lung-breathing amphibian, *Cryptobranchus* must occasionally rise to the surface to draw in air through the nostrils. With the lungs distended the animal may float for a while with part of its back exposed above the surface of the water. By forcibly expelling some of the air from the corners of the mouth, and through the gill slits, the salamander

Holding a recently captured hellbender, Mr. Fowler prepares to place the vigorously squirming amphibian in the net. When searching for this salamander it is best to work up stream, tilting the rocks sideways in the current so that the turbulence rapidly clears, thus preventing the animal from escaping in a cloud of muddy water. A rapid grasp behind the neck will prevent bitten fingers.



The hellbender awaits the coming of dusk in his rocky lair on the river bottom, well camouflaged. Below, a mass of recently laid hellbender eggs. Beneath the egg mass the paternal guardian lies quietly rocking from side to side to aerate the eggs.

sinks slowly to the bottom, where it rests with the lower jaw touching the ground. Vibrations are transmitted through the jaw to the ear bone. This is the hellbender's way of "hearing" under water.

In color the sexes are alike, but in size the males are broader and heavier.

Primarily nocturnal, many individuals leave their rocky hide-a-ways at dusk to plod slowly among rocks and sunken debris, foraging for food. Worms, insects, small fishes, crayfish and even their own eggs and young are on the bill of fare of this creature. The hellbender's voracious appetite will occasionally lead to a fisherman's baited hook. It is then that local papers may carry an acount of a rare and grotesque, four-legged, river "fish" being snared by an astonished angler.

So sanguinary are these animals that they can be aroused from their hiding places by the scent of blood from a bleeding animal carcass placed in the water. In the waning days of August the hellbender becomes less secretive and more social. Often eight or more may be seen lying quietly beside one another in a favored spot. This is the nuptial congress. It serves to stimulate mating. Shortly the more abundant males begin to prepare a homesite for their future family.

A saucer-shaped excavation is made beneath a large rock, with an entrance opening down-stream. The male patiently awaits the female, his head projecting from the entrance. Finally she appears, enters the excavation and begins to lay a string of gelatinous eggs that fuse into a tangled mass, occupying the whole depression. The clutch may contain as many as 350 eggs.

As the eggs are being laid the male moves alongside them and, with a swaying motion, extrudes semen over the eggs, fertilizing them. This external fertilization is the exception among American salamanders and also indicates a close relationship to fishes.

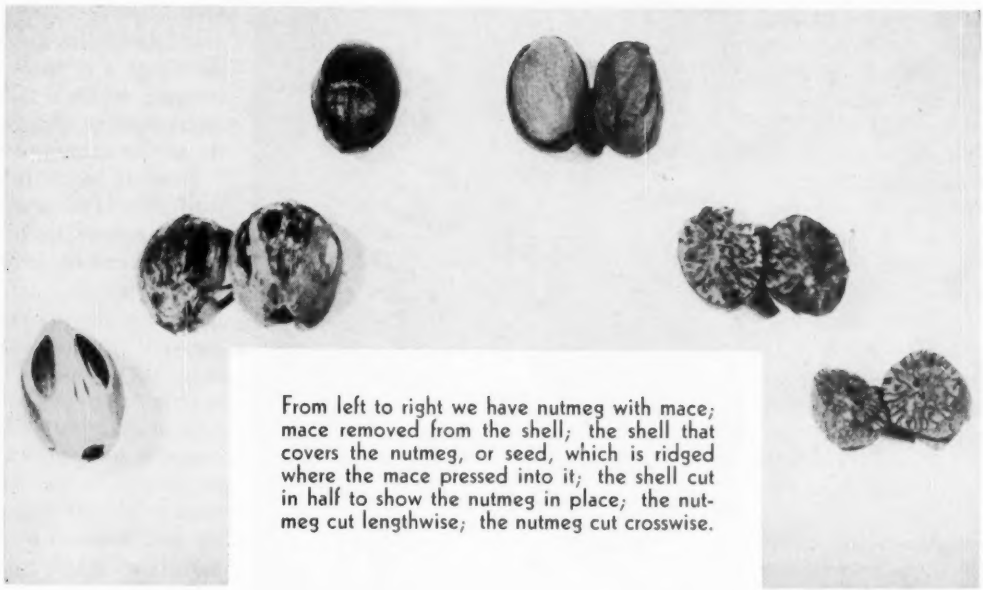
One male may accept and fertilize the eggs of six females, and he alone is responsible for the care of the eggs. The female leaves the den after egg-laying is complete. Taking his parental duties to heart, the guardian of the nest lies beneath the eggs and gently rocks from side to side, keeping the eggs in motion. Thus he aerates them.

The paternal protector is much disturbed by the intrusion of any unmated male into his domain and will lunge viciously at the intruder in an effort to rout him.

The eggs hatch in from sixty to ninety days, depending on the temperature of the water. As they begin to hatch the male leaves, not to return until another fall.

The young larvae have beautiful branching gills often as long as their heads. By the time the young are one year old the gills begin to shrink in size. By the summer of their second year the gills are completely gone, having been replaced by lungs. It may take as long as five or six years before the young hellbender can produce offspring of his own.

The hellbender, forgotten by Nature, spurned by his mother, often eaten by father, with a face only a naturalist could love, is truly an interesting creature.



From left to right we have nutmeg with mace; mace removed from the shell; the shell that covers the nutmeg, or seed, which is ridged where the mace pressed into it; the shell cut in half to show the nutmeg in place; the nutmeg cut lengthwise; the nutmeg cut crosswise.

NUTMEG

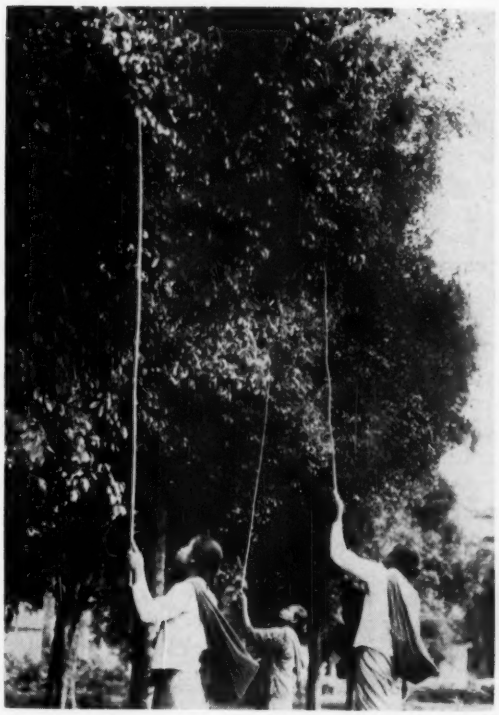
The spice that lent variety to life

By ELSIE A. PARRY

". . . *and add 1/2-teaspoon nutmeg*. . ."

CAREFULLY the housewife measures out the required amount of powdered spice and automatically returns the small container to its accustomed place. Her gingerbread will taste better because of the nutmeg—the cook knows that well enough—but she is probably quite unaware that she is about to stir the stuff of history into her batter. Had it not been for nutmeg and its sister spices, our statesmen would probably not be biting diplomatic fingernails today over the future of the East Indies. Indeed the red Indian might have been longer in peaceful possession of his ancestral acres in what we now call the United States of America.

The early European demand for spices made the land and sea routes from Asia to the west the happy hunting grounds of pirates and brigands, drove Columbus westward across the unknown Atlantic, sent Vasco da Gama around Africa to the Indies, set the Dutch and the Portuguese at each other's throats in an enthusiastic and bitter war. The reward for all this frenzied activity was pepper and cinnamon, cloves, mace and nutmeg. When the Indian ruler of Calicut asked da Gama what had brought him thither, he answered: "Christians and spices!"



Harvesting the nutmegs.

Nature had a controlling hand in the spice epic by making—unhappily for the rest of the world—the East Indian islands the native home of most of them. Tradition has it that "nutmegs must smell the sea and cloves must see it." But so great was the European demand for spices that neither distance nor danger deterred

those who sought them, for, next to gold, they were most worth the risk of life and money. As the coveted source of both nutmeg and mace, the undistinguished evergreen tree known to botanists as *Myristica fragrans* became an especial bone of contention in a lively and bloody melée involving Holland, Portugal, England, and France. For almost two centuries the Dutch held nutmegs and mace in a strangling price-supported monopoly, and only the successful introduction of *Myristica* into other quarters of the globe at last broke the deadlock.

To the modern mind this intense preoccupation with spices is mystifying. Spices certainly add a fillip to food, but why make them a *cause célèbre?* Prosaically enough, the answer lies in the medieval kitchen. The European cook of those days had no way to vary the comparative monotony of the menu except by the plentiful use of spices, and no way, lacking refrigeration, to keep meat for winter except by pickling. And so the aromatic fruits, seeds and barks were used with a lavish hand despite their high cost. The *Household Book* of England's Bishop Percy lists the spices used by his family in 1512, their cost being more than £25: "piper, ginger, Cardmones, Powder of Anies, Mace, Clovves, Saffron, Nuttmegs. . ." "Blaynshe powder," compounded of ginger, cinnamon, and nutmegs, was popular with "Cookes." In 1563 the articles for sale in a London bakeshop included "simnels, comfits, caraways, cracknels, long pepper, and nutmegs." Mace was a prime favorite among the spices and at times was in greater demand than nutmeg. It is recorded that in Europe in 1284 one pound of mace equaled the value of three sheep or half a cow! And the demand exceeded the supply. In those days spices appeared in many medical concoctions and, sanitation being what it was, they also doubled as fumigants. Nutmeg tea, made by infusing the grated seed in boiling water, was considered a cure for insomnia. Many celebrated remedies, such as "Dr. Steven's Water" and the "Vinegar of the Four Thieves," contained the active principle of nutmeg—*myristicin*.

It is time to take a closer look at the ovoid, wrinkled, gray-brown seed whose unexciting appearance belies its historical importance as a provoker of wars, greed and high adventure. The parent tree is somewhat bushy and spreading, the yellow, waxy flower is tiny although aromatic, the fruit is a fleshy drupe resembling a large apricot and enclosing a glossy, deep-brown nut. Around this nut clings a crimson, net-like covering, which is the mace of commerce; within the nut is the seed or nutmeg proper.

Botanical drawing of the nutmeg and its parts.

There is much in nutmeg cultivation of prime importance to the planter, such as soil, pests, grafting and fertilization, but the layman's interest begins when the spice is ready to harvest. *Myristica* bears more or less the year round, but more heavily at certain seasons. The flesh of the fruit is either discarded or made into a spicy jam for local consumption. The mace is carefully removed from the nut, flattened by hand or with boards, and dried either in the sun or by artificial heat, its bright red turning to dark reddish-yellow in the process.

The brittle shells of the dried nuts are broken open by means of wooden mallets or machinery, and the nutmegs removed. They are tested by bouncing upon an iron plate. From the sound an experienced worker can tell instantly whether or not a nut is worm-eaten or otherwise damaged. Nutmegs are usually limed to discourage insects; hence the whitish appearance of their longitudinal furrows.

The spice trade is still important, but today the emphasis has shifted. We are much more likely to fight a war over oil than over pepper, cloves and nutmegs! But the East Indies still supply large quantities of nutmegs and mace to the Orient, where for centuries these spices have flavored the bland rice dishes, and little Grenada in the British West Indies has clothed the fertile slopes of her beautiful mountains with this profitable immigrant from the Indian Ocean. A full-grown nutmeg, ready for shipping, weighs only a small fraction of an ounce, but in 1953 the United States Department of Commerce prosaically recorded that nutmegs arrived in the United States to the surprising tune of 3,979,421 *pounds*, with mace accounting for 582,722 pounds. Together these had a dollar value of $1,318,455. This concrete evidence of the continuing importance of nutmegs and mace would not have amazed a medieval housewife, who depended on these spices to help make food palatable. How could she have made a "Ragoo of Pigges Eares" without them?

> "Take a quantity of pigges eares and boil them in half wine and the other water. Cut them in small pieces, then brown in a little butter, and put them in & a pretty deal of gravy, two anchovies, an eschalot or two, a little mustard, & some slices of lemon, a lyttle salte, & season (*Continued on page 162*)

Alexander Wilson:

Father of American Ornithology

By W. L. McATEE

Wilson's Plover

IN ELIMINATING non-conformists, Europe has long exported some of its best brains to America. The process, which still continues, was begun in colonial times and Alexander Wilson was one of its fruits. That he was among the better minds is proved by his producing a work that has earned for him the well-merited title of "Father of American Ornithology."

And what was his sin of non-conformity? He was a weaver, and in what we would call labor troubles, wrote some satirical verses that were adjudged libellous of certain of the employing class. He was condemned to burn the lampoons at the town cross, was heavily fined, and sent to jail. Surely enough to turn his thoughts to the land of freedom, to which he fled in his 28th year.

Of his early life, it is recorded that his schooling was limited and interrupted by service as a herder, in which he was negligent through often becoming engrossed in some book. His mother died when he was ten, and a step-mother's aversion forced him to go to the home of a brother-in-law—William Duncan. At the age of thirteen, he was apprenticed to Duncan to learn the weaving trade, which, however, he did not like. Both deviated into peddling, welcome to Wilson for its freedom, and for the chance to see the natural and historical features of Scotland. Other compensation must have been inadequate, as both returned to the loom. Wilson kept up reading, especially of the leading poets, and wrote poetry himself, a volume of which was published in two editions (1790, 1791). One of his productions, "Watty and Meg," attained popularity and was sometimes attributed to Robert Burns, then at the height of his career.

When the decision to leave Scotland was made, accompanied by a nephew (also named William Duncan), Wilson walked to Port Patrick, crossed to Belfast, Ireland, and embarked on a vessel bound for New Castle, Delaware. There he landed July 14, 1794, with a fowling-piece in his hand and a few shillings in his pocket. They set out on foot for Philadelphia; on the way Wilson spied and shot a red-headed woodpecker, which he thought the most beautiful bird he had ever seen.

At, and about, Philadelphia, a series of jobs were tried, including copper-plate printing, weaving, peddling, and school-teaching. He made a trip to Virginia but found conditions no better there. School-mastering, although disliked, was his main dependence for several years. One notable interruption was a walking trip (with his nephew) to the Genessee country in New York, nearly 800 miles there and back.

Alexander Wilson, 1766-1813.

He changed schools several times, at length coming to one near Gray's Ferry on the Schuylkill. While there, he became acquainted with William Bartram, naturalist, and Alexander Lawson, engraver, who encouraged and aided him in the study and delineation of birds. His friend and biographer, George Ord, says, "There was magic for him in this employment which aroused all the energies of his soul." It was, in fact, what he had been looking for all his life but did not find until his 38th year.

In 1804, he began systematic collecting and drawing of birds, and in October of that year, in furtherance of the work, he made a journey to Niagara Falls, about 1200 miles the round trip. This inspired him to write a long versified account of his experiences, entitled, *The Foresters*, which was published in the Port Folio. In 1806, he applied for a place on what was later known as the Lewis and Clark Expedition, but did not even receive a reply to his letter to President Jefferson, who organized the exploration.

A favorable turn of fortune soon came when he was employed by Samuel F. Bradford as assistant editor for an American edition of *Rees's New Cyclopaedia*, giving him the most stable employment and the best pay of his career. Wilson soon explained his plan for a work on American birds to Bradford, who agreed to publish it.

He applied himself diligently every moment that could be spared from his editorial duties, although keeping up his field work also, as on a collecting jaunt in Pennsylvania in August, 1807.

The first volume of the *American Ornithology or a Natural History of the Birds of the United States* appeared in September, 1808. The latter part of that month, with a sample copy in his pack, he set forth in search of subscribers, going as far as Maine, studying birds also on the way, and getting correspondents to help with future installments. Shortly after returning from the north, he went south, continuing to Georgia, and reaching Philadelphia again in March, 1809. On the northern round he obtained 41 subscriptions at $120 each, and on the southern one, 250. There were only 200 copies in the first printing of Volume I, but another 300 were soon run off. In a letter to Bartram from the south, he mentions having been on several excursions with John Abbot, the Georgian painter-naturalist, who supplied Wilson later with observations and specimens for his work.

PURPLE HEART AWARD

A bit of ham-fat in a shiny pan
(That once contained a little frozen pie)
Attracted one small warbler, come to scan
Our shrubbery for insects. Quick and shy,
He landed on the window feeding-tray
Then sat as weightlessly as cotton fluff
Upon the pan's edge, where he pecked away
Until the jealous linnets drove him off.
"Coward!" I whispered as he fluttered down
And later wished the epithet unspoken:
He came again, alone. One foot hung down
And then I saw his tiny leg was broken.

Little wounded soldier, hear me say
"You're welcome just as long as you will stay."

Ruth Seymour Vesely

Now that the work was well under way, field trips were interspersed with Philadelphia sojourns, and the publication of additional volumes. Following the appearance of Volume II in January, 1810, he proceeded to Pittsburgh, embarked in a skiff in which he went by river to Louisville, whence he rode horseback to Natchez and New Orleans, returning via the Florida Keys and to New York by boat. On this trip he met John J. Audubon at Louisville. In ignorance of the other's project, each has been working on a comprehensive and fully illustrated treatise on American birds. Wilson rather laconically remarked, "went pigeon shooting with him, examined his drawings in crayons. Very good." Audubon's first publication of *The Birds of America* did not occur until fourteen years after Wilson's death.

Our subject lived most of the years 1811 and 1812 with William Bartram, whose facilities were favorable to progress on the *Ornithology*, four volumes of which (III to VI, inclusive) were issued in those two years. In September, 1812, he turned to the north again, reaching New Hampshire, where he was arrested as a suspected spy but was soon released. During this general period, he made five trips to the New Jersey coast to study shore and water birds. It has been calculated that the travel he performed in the interests of his ornithology totalled more than ten thousand miles.

In 1813, the final volume (VII) issued under his supervision was published. Weakened by unremitting toil, he could not throw off an attack of dysentery following a cold that resulted from his swimming a river in pursuit of a bird, and he died on August 23. He was buried in the cemetery of the Swedish church of the district of Southwark, Philadelphia.

A biographer in *Appleton's Cyclopedia* states that, "In personal appearance Wilson was tall and handsome, his dark brown hair hung over his shoulders, his countenance was thoughtful and expressive, and his conversation remarkable for vividness and originality." And George Ord adds that he was honorable, abstemious, truthful, sociable, and affectionate, but could not endure criticism, and would seldom forgive an injury. This seems almost a catalog of Scottish national traits. However, Wilson came to this country to be an American and was thoroughly patriotic.

In a letter written on his northern excursion of 1808, he stated, "I visited the celebrated Bunker's Hill, and no devout pilgrim ever approached the sacred tomb of his holy prophet with more awful enthusiasm, and profound veneration than I felt in tracing the grass-grown intrenchments of this hallowed spot, made immortal by the bravery of those heroes who defended it." In another missive, he related that he met two men who had been in the engagement and "with these two veterans I spent three hours, the most interesting to me of any in my life. . . The old soldiers were highly delighted with my enthusiasm." Among poems, he wrote was a Dirge for Washington and an Ode on Jefferson and Liberty. He also delivered an oration on the Power and Value of National Liberty at Milestown, Pennsylvania in 1801, that was published the same year in Philadelphia.

And now something about his great work, the title and progress of which have already been cited. It consists of nine volumes, two of them posthumous, the span of publication extending from 1808 to 1814. The pages measure 10 by 14 inches and most of the surface of the plates (of the same size) is taken up by the figures. The letter-press, including prefaces, indexes, etc., runs from 112 to 164 pages to the volume. There are 76 plates containing 320 individual portraits of birds. Considering the brevity of Wilson's training in drawing, the results are surprisingly good. Almost all of the pictures are faithful in detail and many of them are lifelike in appearance. Usually there are no backgrounds excepting perches. In Volume II, Wilson introduces figures of the nest and eggs, as well as of a larkspur flower, with those of a pair of hummingbirds; and also portrays a bobolink on a rice head. His pigeon hawk in the same volume (Pl. XV) compares favorably with (*Continued on page 164*)

Consider the Lilies

By E. LAURENCE PALMER

Illustrations by Elizabeth Burckmyer from Palmer's Fieldbook of Natural History, published by McGraw-Hill.

This is the eighty-fifth in NATURE MAGAZINE'S *series of educational inserts.*

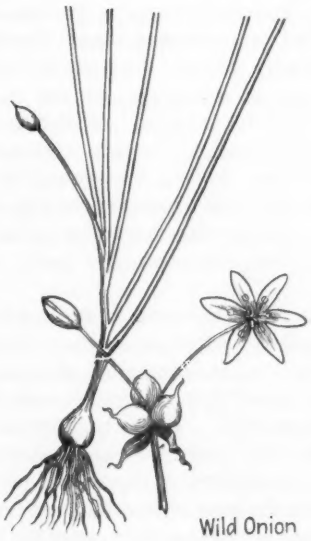
"Consider the lilies of the field, how they grow; they toil not, neither do they spin; and yet I say unto you, that even Solomon in all his glory was not arrayed like one of these."

HERE, FROM the sixth chapter of Matthew, the 28th and 29th verses, comes the suggestion that inspired this special insert. We have widened the field a bit and have included lilies of the forest, swamp and hothouse, as well as those of the field. Further, we have not considered the lilies for their beauty alone, but also for their usefulness as food and medicine, and as sources of useful resins, dyes and other materials.

I devoted the School Page in the October, 1954, issue of *Nature Magazine* to what I thought of the destruction facing those glorious lilies of the West, the Joshua trees. In other inserts I have included information on lilies, none of which is here considered. These other lilies include the following: Joshua tree, #13; onion and asparagus, #18; bowstring hemp, #26; trillium, yellow lily, and adder's tongue, #39; tulip, tiger lily, and Siberian squill, #49, and asparagus fern, #63. Even with the eighteen additional lilies here included we can hardly do justice to this most important family of plants. Our most important omission will be, perhaps, the yuccas.

The Bible, of course, is not the only book in which we find widely quoted references to lilies. Somehow these plants often tend to be associated with purity, chastity and virginity. Whether this is a valid assumption can probably be questioned since a lily undoubtedly is no more chaste than is a skunk cabbage. However, we must bow to the reputation the plants have by this time acquired.

Sego Lily
Mariposa Lily



Wild Onion

Clintonia

James Thomson, in "The Seasons," tells us: "Her form was fresher than the morning rose, when the dew wets its leaves; unstained and pure, as is the lily or the mountain snow." Andrew Lang, in his "Vow to Heavenly Venus," says: "Like these cool lilies may our love remain, perfect and pure, and know not any stain." But if we may question the right of lilies to continence we cannot differ with those who recognize their exquisiteness and perfection as something difficult to represent by artificial means. Shakespeare, in *King John*, says:

"To gild refined gold, to paint the lily,
To throw perfume on the violet,
To smooth the ice, or add another hue
Upon the rainbow, or with taper light
To seek the beauteous eye of heaven to garnish
Is wasteful and ridiculous excess."

If you happen to feel that you must try to improve the lily by bringing it under cultivation, or to save wild plants threatened with extermination by urban development or by the construction of a throughway or superspeed highway, you might like to read either of two books on the subject. These are *Wild Flowers and How to Grow Them* by Edwin F. Steffek, published by Crown Publishers of New York, or *Growing Woodland Plants* by Clarence and Eleanor G. Birdside, published by Oxford Press of New York. Since each of these books suggests how many of our most attractive wild lilies may be grown from seed, they might well be consulted by any who have the urge to take something

Bellwort

Garlic

Indian Cucumber

False Solomon's Seal

beautiful from its natural setting and try to adjust it to less suitable surroundings. Either of these books is likely to discourage a tendency to be destructive of wild flowers. Of the two I prefer the first mentioned.

If one should be seriously interested in establishing one's own garden of wild flowers, including the lilies, it would be well to correspond with The National Wild Flower Preservation Society, 3740 Oliver Street, N.W., Washington, D.C. Ask for a copy of their bulletin that lists dealers who can supply seeds, bulbs and other plant parts with which to start or enrich a wild flower garden. Dr. P. L. Ricker, the president of the Society, and Dr. Edgar T. Wherry, the honorary president, are both gentlemen whom you should learn to know through their writings, or through correspondence, if you are denied the privilege of knowing them personally, an honor that I have long appreciated.

We cannot long think of lilies without returning to the references made to them by the poets. Not all poets treat them with uniform respect, and not all feel that the lily's reputation for purity is wholly to be desired. Hood, in his "Flowers," writes: "The lily is all white like a saint, and so is no mate for me." Ruskin, writing on personal beauty, tells us: "Remember that the most beautiful things in the world are the most useless; peacocks and lilies for example." With a statement like that I can take dynamic exception. Neither peacocks nor lilies are useless. So far as the peacocks are concerned I will refer you to many artists, to the fifty-third insert in this series, or to any fisherman who ties his own flies. So far as the lilies are concerned I prefer to be more specific.

A quick glance at the species considered in the chart section of this insert will show you that, when we "consider the lilies," we must recognize that onions, garlic and asparagus are all lilies. They certainly should not be considered as useless. The early Mormons found the Sego lilies the chief defense they had against downright starvation. It is doubtful if *they* would have said that lilies are among the most useless things on earth. Lewis and Clark might not have written one of the most thrilling chapters in American history without the help of these lilies in their stomachs. Indians and early settlers alike relied on the underground portions of lilies when food was scarce and they sought to keep themselves active aboveground.

We are told that in 1953 Texas and New York led in acreage devoted to raising onions. In that year 132,070 acres produced onions for use as fresh or as dehydrated food. The value of the onion crop that year was $36,614,000, and the amount marketed was 1,235,600 tons. While Texas led in acreage, California and New York led in production.

So far as that other important lily crop, asparagus, is concerned, 135,200 acres were devoted to the crop in 1953, with California leading in acreage, and the cash value was $33,804,000. California and New Jersey led in value of the crop produced. So we must recognize that onions and lilies, at least, are not among the most

False Lily-of-the-Valley

St. Bernard Lily

Twisted Stalk

Dracena

Solomon's Seal

Day-lily

Grape Hyacinth

Camass

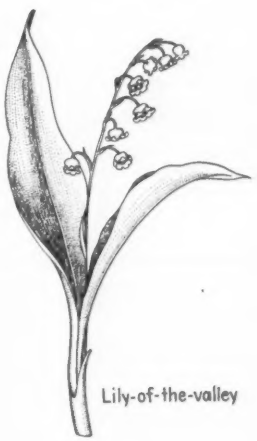
Madonna Lily

useless things on earth. The market value of cauliflower, of lima beans, of beets, of honeydew melons, and even of spinach, was less than that either of asparagus or onions. In 1953 the market value of that other lily, garlic, even exceeded a million dollars in the United States.

While some may be inclined to reckon the value of something only in dollars and cents, there are many people who look for other qualities. Besides the dollars and cents importance, or the emotional stimulus a beautiful lily may give us, we also find other values in the lilies. Medicinal values should not be overlooked, and lilies are the source of resins and stains that give the characteristic color to old violins. We even get some commercial fiber from members of the lily family.

Among the food plants of the family are onion, leek, garlic, chives, asparagus. Lilies that yield fiber include yucca and bow-string hemp. One of the most effective rat poisons is derived from the sea onion, or squill. Flavoring comes from some kinds of sarsaparilla extraction from lilies. *Dracena*, a plant known to most of us as a foliage plant in our homes and greenhouses, yields a useful resin and a dye. Aloes, used medicinally as purgatives, comes from lilies. Some common cultivated lilies, like lily-of-the-valley, may yield a poison or may cause serious dermatitis. This is unfortunate since the plants are so popular with brides. From our wild hellebore comes a poison that I have known to cause a serious skin disease in a woodsman of the most rugged type and yet this same element in this plant has been put to good use in the making of certain insecticides. Garlic, sometimes evident on the breath of those who eat it, yields a most useful antibiotic. The odor of garlic surely discourages some organisms from improving an association. Garlic also yields an element useful in controlling tuberculosis.

It is unfortunate that common names applied to lilies may indicate danger. For example, we hear and read about the food value of camass, and yet there is the closely related death camass, which may become a serious stock-poisoning plant. While our native lilies are not important sources of resins, some Australian plants provide gum acaroides, which is freely soluble in alcohol and finds a ready use in shellac, (*Continued on page 144*)



Lily-of-the-valley

Plantain Lily

COMMON NAME SCIENTIFIC NAME	WILD ONION *Allium canadense*	GARLIC *Allium sativum*	MADONNA LILY *Lilium candidum*	DAY LILY *Hemerocallis fulva*
DESCRIPTION	To nearly 2 feet high. Leaves, nearly flat, to 1/10-inch wide, to 18 inches long, active through flowering time and arising from to several clustered bulbs each to 1 inch high and covered with flimsy net of fiber. Dark green and with strong onion-tasting sap. Roots from base of bulb, many but little branched.	Stem to 2 feet high, round in cross-section and about 2 times length of leaves that arise from base. Leaves to ½-inch wide, long pointed, narrow or keeled, flat rather than round in cross-section as in onion. Bulb of several parts enclosed in silky, whitish or flesh-colored sac, to over 1 inch in diameter, with membranous coats.	Height, to 4 feet, smooth, green. Stems bears leaves along its length, 60-100 in number, to 9 inches long and to 2½ inches wide the longer ones being the lower. Basal leaves appear in autumn. Bulb is white to yellowish, to 4 inches in diameter, globular with many flat scales. Plant is not stem-rooting.	To 6 feet high. Leaves to 1 inch wide and to 3 feet or more long, flat, pointed, like an erect sword but shorter than the flowering stalk, angled in cross-section, pale green arising from coarse fibrous roots. May form dense, compact, persistent pure stand which eliminates most competition over considerable area.
RANGE AND RELATIONSHIP	Order Liliales, Family Liliaceae. Some 300 species in the genus with nearly a dozen in eastern United States. This species found in brushlands, open woods and wet meadows from Florida to New Brunswick and west to Texas, Colorado and Minnesota being found in the Virginia area to elevation up to 2500 feet.	Order Liliales. Family Liliaceae. Native of southern Europe but grown widely in gardens, particularly those designed to serve the tastes of peoples of Mediterranean extraction. Found as escape from cultivation in fields, roadsides and pasture lands from New York to Indiana and west to Kentucky, Tennessee and Missouri.	Order Liliales. Family Liliaceae. Native of southern Europe and southern Asia, but probably the commonest hardy outdoor white lily in flower gardens. Also one of the commonest lilies grown in pots by florists for sale as house flower at Easter time. Believed to be the lily referred to in the Bible, Matthew 6: 28-29.	Order Liliales. Family Liliaceae. Probably originated in Europe, but has been established from France to Spain, and established in America from New Brunswick to Virginia and Tennessee, and elsewhere. Commonly persists on abandoned home sites after most other evidences have disappeared. Closely related to yellow day lily.
REPRODUCTION	Flowers frequently replaced by bulblets. Flowers are pink or white, with stamens just enclosed by sterile parts, borne in umbels of many flowers with 2 to 3 sterile, broad but pointed bracts below and borne at tip of scape which is to 2 feet tall and round in cross-section. Pollination by bees, butterflies, moths.	Reproduced in gardens primarily by planting little bulbs, "cloves" or "bulbils." These bulblets may replace the purple flowers, which are borne in umbels. If flowers are borne, they may have greenish or whitish parts. One anther borne in center. Bulblets set out in early spring mature in fall. Fall sets mature in spring.	Flowers, 3-20 in an open terminal cluster, trumpet-shaped, erect or nearly so, each to 9 inches long, to 2½ inches wide, with pure, waxy, white tube, yellow anthers. Fragrance delicate, exquisite. Seeds germinate in 21 days, may live several years, but plants require several years to reach flowering stage. Chromosome number, 24.	Flowers short-lived, hence the name, which in Greek means "beautiful for a day." Fade and close at end of a day. Borne at top of stem in open clusters of 6 to 12, not fragrant, orange-red (fulvous), 3-5 inches long, with slender 1-inch tube. Fruit oblong, 3-angled, 3-celled, many-seeded, rather persistent.
ECOLOGY	Reproduced by underground bulbs, by bulblets, or by seeds and may become abundant and objectionable in pasture lands. It does not survive plowing or competition with crop plants ordinarily. Odor may enter blood and milk of cattle that may inhale it without even eating the plant. Chromosomes, 16. Favored soil pH 6.5-7.	Favor rich loose soils, but if too rich may produce too luxurious tops and not abundant needed bulbs. Breaking tops just before maturity may help develop bulbs. Bulblets are set in drills about 4 to 6 inches apart. Yields a sulfur-containing antibiotic.	For Easter market bulbs are potted in December in heavy slightly acid soil in 5-6 inch pots. First months 54-56° F. and raised gradually to 60° F. to bring blooms in 13 weeks. Usually 6 weeks needed after buds show, though may be shortened to 2 weeks at 75° F. Garden flowers of course appear later in North.	Does best in meadows, old gardens, or along streams, where it is a persistent perennial. More common than *H. flava*, the yellow day lily, which blooms through June and July, while the *H. fulva* will bloom into late summer. Remarkably free of insect and fungous pests and resistant to drought and flood. Divide 4-5 years.
ECONOMY	Of economic importance since it reduces greatly the value of dairy products affected by its odor. Has some value as flavoring for flat soups, meats and salads. Green tops are eaten raw, dried and stored for use as flavoring or cooked for use in foods. Known as meadow garlic, garlic, and by other names.	Bulbs sold in groceries in strings. Used primarily in flavoring and amount may break or make a meal. Antibiotic is colorless liquid, stable to acid, unstable to heat and alkali, soluble in petroleum ether and irreversibly inactivated by cysteine. Useful in control of tuberculosis. Injured by above 140° F in storage.	L. *candidum* is used for late season Easter and *L. longiflorum* for early Easter. *L. candidum* favored for Mother's Day. *L. regale* may be brought to flower in 65-70 days with first 10 days at 70° F. and last period at 60° F. Rust and plant lice may be serious pests and affect greatly the market value of plants.	Used by gardeners who need quick masses of persistent growth, which may be replaced later by more desirable species, but, as is often the case in such matters, when once established may be difficult to eradicate, although this may be done by repeated cultivation. Chromosome number, 22 and 33.

MARIPOSA LILY SEGO LILY *Calochortus nuttalli*	BELLWORT *Uvularia grandiflora*	CAMASS *Camassia quamash*	GRAPE HYACINTH *Muscari botryoides*	LILY OF THE VALLEY *Convallaria majalis*
Height to 2 feet. Stem unbranched, stiff, erect and arising from a bulbous base with stem usually bearing a single leaf that is somewhat fleshy, narrow, deeply channelled, recurved, to about 6 inches long and covered, usually with a whitish bloom, appearing ashy-green even at a distance.	To 20 inches high. Stem forked near the top and with no more than 2 leaves below the fork, nodding, smooth, round in cross-section and arising from short rootstock that bears fleshy roots. Leaves pierced at base by stem, oval to oblong, to 5 inches long and to 2½ inches wide, smooth above and, when young, fuzzy beneath.	To 3 feet high. Flowerstalk sometimes with 1 or 2 ragged leaves. Leaves mostly arise from base, to nearly an inch wide and to over 2 feet long. Bulb egg-shaped or globe-like, to over 1 inch broad with usually black or blackish enclosing structures. No offsets ordinarily produced by bulbs.	To 1 foot high, with flowers borne in compact spike at upper end of flowering stalk. From base arise 6 to 8 leaves that are to 1 foot long and to 1/3-inch wide, dark rich green and rather thick but grass-like. Bulb relatively small and fleshy, egg-shaped. Chromosome number, 36.	To 1 foot high but commonly less. Unbranched flower stalk. Leaves 2, arising from slender rootstock that branches profusely and gives rise to leaf-bearing shoots. One leaf borne higher than other. Leaves, to 8 inches long and 3 inches wide, with edges turned upward or inward commonly and entire margins.
Order Liliales. Family Liliaceae. Found on gravelly, well-drained slopes and ridges from the Dakotas to eastern Washington and south through Nebraska, Arizona and California, with southern California plants more slender. Particularly well known in sage brush country of Great Basin. At least 50 species known.	Order Liliales. Family Liliaceae. By some listed in a family with asparagus, lily of the valley, *Clintonia*, Solomon's seal, twisted stalk and others. Here considered a lily. Found in rich woodlands from Quebec to Georgia and west to Alabama and Oklahoma, with other species extending the range. Many include *Oakesia* in genus.	Order Liliales. Family Liliaceae. Native of North America, where this species ranges from British Columbia to central California and east to Arkansas and Texas, with other species extending range to Pennsylvania and Virginia. Four species, with 3 western. Favors meadows very wet in spring, very dry in summer.	Order Liliales. Family Liliaceae. Native of southern Europe, but grown in gardens in many parts of the earth where climate is suitable, and may escape and become naturalized but not to be troublesome. Some 50 species of the genus native of southwest Asia and the Mediterranean regions.	Order Liliales. Family Liliaceas. Two species, native of Europe, Asia and North America, with *C. montana* found in mountains from Virginia to South Carolina, and this species escaped from cultivation in many parts of Europe, Asia and North America. Survives on abandoned homesites, sometimes for long time.
From 1 to 5 flowers borne in loose clusters at top of stem, to 2 inches long with white petals tinged with purple, and a purple spot or band above the yellow base. Anthers yellow, to 2/5-inch long. Fruit elongated above the middle, to 2 inches long, forming a capsule.	Flowers yellow, drooping, closed bells to 1½ inches long with 6 similar petal-like structures surrounding 6 stamens that bear narrow anthers. Fruit a 3-lobed, 3-celled capsule-like structure, to ½-inch long. Flowers in April and May. Chromosome number, 14.	Flowers from 10-40, borne at end of 3-foot stalk, white to blue showy parts with sections twisting separately after maturity, to 1 inch long, 3-nerved, with pedicels shorter than the flowers. Fruit to 3/5-inch long, oblong egg-shaped with many-seeded cells. Blooms in May. Chromosome number, 30?	About a dozen flowers each to 1/8-inch long, with recurved parts, blue or, in a variety, white. Uppermost flowers smaller and sterile, all 6-parted. Fruit 3-celled and 3-angled. Stamens, 6, and attached to outer sections in 2 rows. Showy parts of the flowers all alike.	Flowers creamy white, fragrant, drooping bells, to ½-inch across, borne on short stalks from upper portion of flower stalk which is erect or drooping. Fruit a red, few-seeded berry. The three petals resemble the three sepals closely. Stamens are 6 and attached to base of outer structures.
Like most related species can withstand prolonged severe cold but not short quick temperature changes, with alternate freezing and thawing. The perennial underground corm is about size of a walnut and has high nutrition value. Fall-potted bulbs kept at 50° F. can be forced in spring by gradually raising temperature.	Favors soil with nearly neutral acidity of pH 6-8. Not hardy if shade-producing protective woodlands are removed. Associated with ginger-root, great trillium, herb-robert, columbine, dutchman's breeches and pepperwort. Known as merry-bells and large-flowered bellwort. May form large, almost pure stands.	Favors neutral to slightly acid soil that is rich and loamy, can resist drought well. Plant bulbs in garden 3-4 inches apart to 6 inches deep in early fall. Seeds develop into plants with flowers in 3 years and may be germinated in ordinary greenhouse flats. Molasses may be made from bulbs.	Commonly reproduced by bulb division. Outdoors are set to 2 inches apart in fall for early spring flowers. Indoors may be set in pots and covered with mixture of equal parts well-rotted manure, sand and garden soil. Set in dark 2 weeks at 60-70° F. and when started bring into the light.	Does best in shade and in relatively dry soils. May form an almost pure stand, crowding out everything else, therefore useful in path borders. May be set in fall in 6-inch pots of equal parts of sand, garden soil and humus, 10 to a pot. Kept in dark 2 weeks and brought in sun to temperature of 65-70° F.
Indians used to use underground parts as staple food, and early Mormons were often dependent on this source of food. Eaten roasted, boiled, baked or steamed, and may be stored for use when convenient. This is the State Flower of Utah and it has and deserves protection now over most of its range.	Young shoots may be eaten like asparaugus, and roots are reported as being edible when cooked. Because of beauty and relative uncommoness it is recommended that they be eaten only as an emergency food. May be transplanted and grown in wild flower garden under suitable conditions of light and acidity.	Constituted major food of Vancouver Indians and was probably responsible for Nez Percé War in Idaho. Bulbs collected in spring and summer were stored, roasted, fried, boiled and cooked with other foods. Bears favor the bulbs. Should not be confused with poison camass or death camass, *Zygadenus venenosus*.	Hardy and attractive flower for early spring effects in garden borders or in pots in the house. Garden plants will become too crowded ordinarily unless they are taken up about every three years, divided and reset usually in late summer or autumn. Sometimes escape and establish themselves sparingly.	Most popular garden flower and in bouquets for brides. In greenhouse may be forced to bloom at any time of year. Pots are frequently set in water. Greenhouse flowers at best in January-February. Plant yields the poison convallarin and convallamarin, both taken by eating, but dermatitis may be caused by handling.

COMMON NAME SCIENTIFIC NAME	PLANTAIN LILY *Hosta plantaginea*	ST. BERNARD'S LILY *Anthericum liliago*	CLINTONIA *Clintonia borealis*	FALSE LILY-OF-THE-VALLEY *Maianthemum canadense*
DESCRIPTION	To 3½ feet high with flower stems reaching well above spreading foliage. Leaves to 10 inches long, to 6 inches broad, with long petioles, prominent ribs, entire margins, pointed at tip but more or less oval. Root system of strong cordlike materials.	To 3 feet high. Flowering stem unbranched in this species and usually without leaves. Leaves to 1 foot long, ¼-inch wide, abundant, grass-like and much shorter than flowering stalks. Tuber-like rhizome underground bears many small roots and is commonly used in propagation. Chromosome number, 64.	Height, to 15 inches. Leaves numbering 2 to 5 arise from buried base, usually three to a unit. Leaves to 10 inches long and 3½ inches wide, thin, green, relatively shining, oval, bluntly pointed, sheathing at base. May be slightly hairy. Rootstock, slender and well-branched, perennial.	To 7 inches high. Slender, erect stem that zigzags and bears 1 to 3 but usually 2 leaves. Leaves broadly oval with heart-shaped to clasping bases, to 3 inches long and half as wide, ribbed. Stem and leaves with fine hairs or smooth. Rootstock, slender and well buried.
RANGE AND RELATIONSHIP	Order Liliales. Family Liliaceae. Native of Japan and China but well established as introduced plant in Canada and the United States where it is popular in old fashioned flower gardens. There are about 40 known species, including the blue-flowered plantain lily, *H. caerulea*, which has greener, more shining leaves.	Order Liliales. Family Liliaceae. Some 50 species of the genus with *A. ramosum* best known under cultivation. Native of Europe and northern Africa. Related genera abundant in Africa. Widely grown as ornamental because of ease and hardiness. Generic name means appropriately "flower hedge," which indicates its common use.	Order Liliales. Family Liliaceae. About 6 species native of North America and Eastern Asia. This species ranges from Newfoundland to North Carolina and west to Manitoba and Wisconsin, at an elevation of 4500 feet in Virginia. Common in moist woodlands and bogs where there is brush. May be locally abundant.	Order Liliales. Family Liliaceae. Four species found in North Temperate areas. This species ranges from Newfoundland to North Carolina and west to Tennessee, Iowa and the Dakotas, reaching in Virginia to elevations of 5000 feet. It may form relatively pure stands, but usually does not do so.
REPRODUCTION	Flowers to 5 inches long, trumpet-shaped, waxy white, showy, highly fragrant, many pointing upward, with the 6 lobes shorter than the long, slender tube and flaring widely when mature. Stamens, 6; long. Flowers in August and September. Pollinated by insects. May bloom in 2 years from seed and is perennial.	Flowers, white, to many in loose clusters on unbranched flower stalk. Flower stalk branched in *A. ramosum*. Flowers star-shaped, not too showy, to ¾-inch across. Petals and sepals alike and total 6, commonly with greenish tips. Fruit a pointed, round capsule in *A. liliago*, and a rounded tipped capsule in *A. ramosum*.	Flowers greenish; yellow bells that droop, are borne in loose clusters of 3 to 6 on slender upright flowerstalks. Flowers to 1 inch across, inconspicuously colored. Anthers to 1/8-inch long. Fruit a wonderful blue berry, many seeded, to 1/3-inch through. Flowers in May and June. Fruits may persist through winter.	Flowers small bells with segments about 1/16-inch long, borne in loose clusters to 2 inches long at end of flower stalk. Showy section of flower in 4 parts. Stamens, 4. Ovary and fruit two-celled. To 12 flowers on a plant; appear in May to July. Fruit speckled berries, pale, appear in summer.
ECOLOGY	At best in rich moist loam in partial shade. May be destroyed by frost or intense sun. Seeds should be sown as soon as ripe and not stored. Common reproduction is by division of root system in fall or early spring. Should be mulched lightly before frost. Relatively free from insect and fungous pests.	Does well in shade where temperature ranges from 60-70° F. Needs little water or care and has few enemies in the insects or fungi. Best to water well when in full bloom. Needs mulch protection in winter where weather is severe. May be grown indoors but lacks beauty to be a favorite where any care is required.	Favors soil with acidity of pH 4-5, with good drainage, ready supply of moisture. May be propagated by seeds if fruit pulp is removed and seeds planted, blooms may be developed in 2-3 years. Also may be propagated by dividing rootstocks in fall. Requires shade. usually found in wild areas rather than in parks and the like.	Commonly associated with witch hazel, flowering dogwood, striped maple, shadbush and yew in soils of pH 4-5. May appear in white pine forests rather abundantly. May be grown in rock gardens or in table terraria if care is given to physiologic needs and where its berries may prove attractive.
ECONOMY	Popular in gardens, particularly because of short time from seed to seed, because of hardiness and freedom from pests, because of beauty of flowers and above all because of fragrance. Regretable that flowers do not last longer. Has something of the fragrance of orange blossoms.	Commonly reproduced by division of underground parts, by layering of stolons, making slips of stolons and rooting in water, or even by leaf cutting and rooting. Relatively common garden flower in spite of its lack of spectacular beauty so common with its close relatives.	A most popular woodland flower named after Governor Dewitt Clinton of New York, a naturalist. Also called bear tongue, cow tongue, dog berry, wild lily of the valley. Poets refer appropriately to the "rare blue of clintonia berries." Reputed to have some remote medicinal value.	Known as bead ruby, and the name means Mayflower. Also called one-leaf because young plants apparently bear but one leaf. Fortunately it is too small and inconspicuous to be attractive to wild flower collectors, and it may survive after more conspicuous plants have disappeared.

SOLOMON'S SEAL *Polygonatum biflorum*	FALSE SOLOMON'S SEAL FALSE SPIKENARD *Smilacina racemosa*	INDIAN CUCUMBER *Medeola virginiana*	TWISTED STALK *Streptopus roseus*	DRACENA *Dracena fragrans*
To over 3 feet high. Stem slender, bending at tip, unbranched, smooth, zigzag above, bearing leaves that are smaller as they approach the tip. Leaves, to 4 inches long and 2 inches wide, pointed at tip, rounded at base, without petioles, entire and usually bearing flowers or fruits at base. Substantial rootstock.	To 3 feet high. Stem slender, arching at tip, may be strongly angled and finely haired towards free end. Bears flower cluster at end rather than at leaf bases. Leaves, to 10 inches long and to 4 inches wide, ribbed, fuzzy beneath, pointed, with entire margins. Rootstock, coarse, rough, fleshy, horizontal, thick and perennial.	Height to 2½ feet. Slender, erect stem, rather brittle, bearing whorls of leaves rather well separated. Leaves to 5 inches long and to 2 inches wide, ribbed, usually narrowest at the tip, and those of the lower whorls much larger than those of the upper, the upper rarely being more than 2 inches in length. Interesting rootstock.	To 2½ feet high. Stem may be branched or unbranched, is ridged, twisted, somewhat fuzzy, with leaves rather evenly placed along the stem. Leaves to 4½ inches long and to over ½ that width, broadest near base, without petiole, ribbed, in general egg-shaped but pointed at tip. Stout rootstock covered with fibrous roots.	Height to 20 feet. Stem branched or simple. Leaves, alternate, weak, to 3 feet long and to 4 inches wide, shining green and often variegated, recurved and narrowed at base. Many varieties recognized by the color pattern of the leaves. Leaves usually crowded. Stems woody in some related species in tropics.
Order Liliales. Family Liliaceae. About 30 species known in North Temperate Zone, with this species ranging from New Brunswick to Florida and west to the western half of the Mississippi Valley. Four species known in eastern North America and extending range into Mexico and Manitoba; others to west.	Order Liliales. Family Liliaceae. About 25 species found native of Asia and North America, all with unbranched stems and stout horizontal rootstocks. This species ranges from Nova Scotia to Georgia and west to British Columbia and Arizona, reaching an elevation of 2500 feet in Virginia. Does best in soils pH 5 to 6.	Order Liliales. Family Liliaceae. But one species in the genus. Ranges from Nova Scotia to Florida and west to Tennessee and Minnesota. On occasion it may be rather abundant, but it does not survive heavy harvest or injury that is severe. Closely related to trillium, smilax and hyacinth.	Order Liliales. Family Liliaceae. Two varieties of this species, and three varieties of another species, recognized in eastern United States and this species spans the continent as does *S. amplexifolius*, the white manadarin. In *roseus*, the flower tips recurve in age, while in *amplexifolius* the whole segments recurve.	Order Liliales. Family Liliaceae. By some placed in family Agavaceae, with yucca, agave and sansevieria. This species native of New Guinea or upper New Guinea, but known throughout the world where greenhouses are maintained. Used as leafy ornamental. Some 50 species and many more varieties known.
Flowers borne in axils of leaves in clusters of 1 to 4, hanging on short stems, greenish, each to ½-inch long and inconspicuous. Fruits are dark blue berries, to ¼-inch in diameter and usually persisting until late season unless eaten. Chromosome number, 20. Does best in soils at pH 4.5 to 5.5.	Flowers borne in terminal clusters on many branches, each making a loose spike. Flowers white or whitish, each to 1/6-inch in diameter, appearing in May through July. Fruit red, fragrant berries, each to 1/4-inch through and speckled with purple. May persist until late fall unless eaten. 2 seeds in each fruit cavity.	Flowers relatively inconspicuous, borne on inch-long stems arising from axils of uppermost whorl of leaves, erect or drooping, segments about ½-inch long, 2 to 9 flowers per plant. Unusually long styles. Fruit a dark purple berry, ½-inch in diameter. Chromosome number, 14.	Flowers borne in ones or twos in axils of leaves on inch-long stems, with attractive rose-purple segments that are to ½-inch long and hang like bells. Fruit is a cherry-colored, translucent sphere, a berry, many-seeded, seeds in 2 rows in each cell. Fruit of *S. amplexifolius* is white instead of red.	Flowers in long recurved clusters, the clusters being to 1 foot long and the individual flowers to 2/3-inch long. Flowers yellow, with narrow segments. Flowers are uncommon, particularly on greenhouse plants, and plants are usually classified on color patterns of leaves. Fruits small orange-red berries.
May be reproduced by seeds or by separating the horizontal rootstocks, which bear characteristic stem scars resembling a seal and giving the plant its name. Each scar may indicate the end of a year's growth of the rootstock. Rootstocks, replanted, may lie dormant a year before sending up a new shoot.	Chromosome number, 36? Commonly associated with Solomon's seal and mixed woodlands in rich deep soil but may be found in shallow soil on hillsides if moisture is abundant. Horizontal rootstock lacks characteristic scars of the Solomon's seal. Without fruits, flowers or rootstock bears some resemblance to Solomon's seal.	Commonly found in rich, deep woodland soil associated with maple, beech and hemlock. It favors deep soil that is loose. The rootstock is horizontal, to 3 inches long, whitish, delicious and with taste of cucumber, but should not be eaten because the living plant is more appealing to the sight than the root to the taste.	Found in moist woodlands, with *S. amplexifolius* being found in Europe and Asia as well as in America. Pollination is effected by visits of bumblebees and by bee-like flies. Strangely enough we do not find this plant listed as having any medicinal properties, although many of its close relatives are so reported. Favors soils pH 5.5.	At least 14 horticultural varieties based on leaves are commonly recognized. Possibly most famous dracena is the dragon tree, *D. draco*, of the Canary Islands, which reaches a height of 70 feet and is famous as one of the world's oldest trees. Usual plants may survive in households as ornamentals for years.
Early spring plants may have some food value and may taste like asparagus, either raw or boiled. Indians reported to have eaten rootstocks, and early French colonists ate the rootstocks when starvation threatened. This obviously was an emergency food even then.	Berries have been eaten either cooked or raw. Root is reported as source of medicine as an expectorant, mild stimulant and was used by old Indians to promote easy and supposedly painless childbirth. Dose was 2 teaspoonfuls of ground rootstock to 1 cup of boiling water, and to 2 cups of this a day.	Indians used to feed regularly on the rootstock. Adopt the practice of never eating one of these roots unless at least 3 others are left untouched within a three-foot radius, then it can never be completely eradicated and even then do not eat the roots unless you have do so.	Apparently no great importance to man except for beauty the growing plants give to the woodland in which they are found. Possibly because of the relative inconspicuous nature of the flowers the plant is not even sought by the usual woodland wild flower gatherers who destroy so many attractive plants.	Woods popular as interior decorating element. The red resin dragon's blood from *D. cinnabari* has been used extensively as dye and stain and is the commonest stain used in coloring violins, particularly in 18th century violins. Some similar resins derived from American dracenas.

(*Continued from page 139*)
lacquers and in staining wood and leather. Several thousand tons of this material are reported to have been produced annually for the world market in Australia. I hope that by this time I have, without even mentioning the commercial value of lilies sold for their beauty, shown that lilies are far from being the most useless things on earth. Possibly Mr. Ruskin should have had a little course in economic botany before he wrote so glibly.

If we refer to the lilies, important because of the beauty of their flowers, we would have to include many well-known plants. It is estimated that there are at least 300 to 400 species—and many more hybrids—of lilies under cultivation in the United States. Among the well-known and popular genera in this group would be *Lilium*, *Hermerocallis*, *Tulipa*, *Calochortus*, *Scilla*, *Muscari*, *Hyacinthus*, *Sansevieria*, *Asparagus*, *Convallaria*, *Hosta*, *Aspidistra*, *Smilax*, *Yucca* and *Dracena*. Botanists differ on the composition of the family Liliaceae, and if we made a composite of the judgments of all of them we would have to include other important genera. It is interesting to note that there is some confusion between the names used by technical botanists and the laymen when they consider lilies. The "smilax," which is so popular in adding a lacy greenery to bouquets for funerals or for weddings, is really an asparagus, and the sarsaparilla, to which we referred earlier as coming from a lily, has a counterpart in a sarsaparilla that comes from the remotely related group of plants to which ginseng belongs. As is usually the case, it is dangerous to place too much dependence on common names when dealing with plants, or with animals.

One might assume that water lilies were lilies because of their common name. This is not the case. Our common columbine is sometimes referred to as a rock lily, but this does not mean that it is a member of the lily family. It belongs in the same family as the buttercups, which also includes the beautiful pasque flower of our prairie States. Incidentally, it is also sometimes called rock lily. Even our commonest bindweed, *Convolvulus*, is often referred to as lily-bind, but it has almost no relationship to the true lily. When we are asked then to "consider the lilies" we may wonder just where we should stop looking. We have chosen here to stick rather closely to members of the family Liliaceae. Certainly we would in this way eliminate the waterlilies and the bindweeds, even though they may have beauty worthy of recognition.

Most of our lilies are perennial plants. Most of them produce substantial underground parts in which food is stored during the summer growing season. It may take a number of years for this underground part of the plant to build up enough reserve so that a flowering stalk can be sent up to bear the flowers. Some suggestion of how long this may take in some lilies is given in the chart section.

After a lily has developed a flower stalk for the year, and has matured fruits from the flowers, it must restore the exhausted supply of food underground if it is to flower again the next year. It cannot do this, of course, if the whole plant above ground is broken off and carried away. As a result, many lilies suffer because of the carelessness of flower gatherers. If you have the opportunity to visit an area where trillium grows, and where collectors have not been long at work, compare the size of the flowers with those produced on plants in parks where year after year the tops are destroyed in one way or another. You just cannot survive if you take wealth away year after year and never restore it. This is just as true in plant economy as it is in practising personal or civic economics.

We have recommended, then, that under ordinary circumstances you train yourself to get your satisfaction from lilies by enjoying them growing where they naturally grow. If you must collect plants please make a point to never take the last representative of a species in a three-foot radius. Better yet, see to it that you leave at least three healthy plants growing in your three-foot circle. So far as I am concerned I would favor increasing the number or decreasing the size of the circle, but I am afraid that that might be expecting too much.

Why not learn to become a photographer and start making your own collection of colored transparencies of the wild flowers of your neighborhood. Last fall I started making such a collection of pictures of goldenrods and asters. I did it because the first time I ever took an organized class of students into the field my boss, the late Professor W. W. Rowlee, asked his new assistant to concentrate on goldenrods and asters. He made this request at 10 o'clock on the morning of the day in which the field trip was to be held. I doubt if there was ever any time in my life when I was busier and more worried than those few hours that preceded my taking Axel Olsson of Coral Gables, Florida, Prof. C. P. Alexander of Massachusetts State University, Charles Plunkett of New York City, and some fifteen other students on that trip. I confess that most of my time in that preparation period consisted of going over the planned trail plucking and hiding the remains of the goldenrods and asters that I did not know, or planning the trail so that the unknowns would be carefully passed by.

When I get through making my present collection of transparencies of the local goldenrods and asters I can sit back in my old age and vicariously go over that trip again. Before that time I hope to make similar collections of pictures of the lilies, although I never had them "rammed down my throat" so suddenly as on that September afternoon in 1910 when I almost learned to hate anything that looked like a goldenrod or aster. Familiarity with them, however, did not breed contempt, and I am sure that if you "consider the lilies" you will learn to like them whether you eat them, use them as medicine for your stomach, or merely to enrich your soul.

"Consider the lilies of the field; how they grow" and you should have a Happy Easter in more ways than one.

Nature's Harshness and Man's Compassion

By ALEXANDER F. SKUTCH

Those of us who practice mercy and forbearance in our dealings with the living world, and sometimes make gentle efforts to bring others to our point of view, are often reminded, with amused tolerance or with scorn, that Nature is "cruel." These critics of our compassionate attitude point out that merciless competition is the rule of Nature, that everywhere the strong take what they want without regard for the feelings of the weak, that man is part of Nature, and that if we are to continue to survive we must follow Nature's law. Compassion, they may further assert, has its place in the relations between man and man, but hardly applies to man's dealings with the rest of the animate creation.

This alleged cruelty of Nature deserves our most careful consideration, for our whole attitude toward the living world will be profoundly affected by our view of it. In general, the philosophers, who cast a coldly appraising eye upon Nature, have taken a rather gloomy view of its harshness. One recalls Herbert Spencer's opinion that torturing parasites outnumber in their kinds all other organisms, and Schopenhauer's vivid word-pictures of the sufferings of life. But naturalists, who gratefully recall their many happy hours in the woods and fields, have a strong tendency to adopt the opposite view, to emphasize the joys and satisfactions in the lives of free animals, to minimize their sufferings, and often to gloze over the disagreeable facts of the natural world. Probably the truth lies somewhere between these two extreme attitudes.

Before we attempt to settle this question, we must have clearly in mind what we mean by "Nature," and what by "cruelty." A characterization applicable to Nature looked upon as a personality directing the affairs of the earth and its inhabitants may become wholly inappropriate if we hold some other concept of Nature. In the present discussion, we shall mean by Nature the totality of the processes that have created and maintain the physical world and all the living things it supports. Nature may be something more than this impersonal aggregate, but for our immediate purposes this definition will be adequate. Turning now to cruelty, it is necessary to distinguish clearly between mere callousness and the infliction of suffering for the pleasure or amusement it affords the spectator. The carter who applies the goad without mercy to his overloaded oxen is probably callous rather than cruel in the narrow sense of the word. His motive is to get his cart up the steep slope rather than to make his beasts suffer. On the other hand, the boy who tortures an animal to see it writhe, or the spectators who flock to a bull-fight because they enjoy a bloody spectacle, are cruel at heart.

Of cruelty in this narrow sense, there appears to be little in Nature, apart from man. The cat's play with a mouse is a favorite example of the inherent cruelty of animals; but I doubt whether she finds pleasure in her captive's fear and pain, or even thinks about it. The skillful execution of an instinctive act seems to be the source of her gratification, and the mouse's feelings probably do not enter into her picture of the world. The great majority of predatory animals appear to capture no more victims than they need to satisfy their hunger, and to kill with no deliberate elaboration of the act. On the whole, the death of creatures devoured by predators is far swifter and easier than that of the millions of unretrieved victims of gunshot that hunters each year leave to the horrors of festering wounds and slow starvation. Yet the death of animate prey is not always so sudden and merciful as we like to imagine it. Hawks sometimes calmly proceed to pluck all the feathers from a captive bird that is far from dead; and carnivorous animals, no less than savage men, at times tear the flesh from a living victim.

If we add to the countless thousands of animals that each day give up their lives to fill the maws of other animals, the myriad more that die slowly and horribly from bacterial and protozoan infections, and all those that are gnawed, punctured and lacerated by an innumerable horde of parasites of the most diverse sorts, I believe we must agree that the amount of carnage and mutilation in Nature is incalculably vast. How much pain and suffering accompanies all this disease and death is another question, and one far more difficult to answer. As every amateur in scepticism knows, pain, like pleasure, is strictly demonstrable only when felt in our own person. It is just here that the naturalist-writers who like to hide the disagreeable aspects of Nature try to profit by our ignorance. They can not deny the obvious fact that there is much carnage in Nature, but they often maintain that it is effected with far less suffering than we naively imagine, citing, perhaps, the well-known story of the explorer

Livingstone, who felt no pain while actually in the lion's jaws.

It is most difficult for us to assess either the joys or the sufferings of beings, including men of alien cultures, whose heredity and background are different from ours. At times I have been amazed by the number of kicks, each hard enough to kill a man, that a horse will take without seeming to mind them; yet a horse with a disordered stomach gives every indication of the most acute distress. But since suffering and happiness are correlative states of consciousness, if we diminish the capacity for experiencing one we must in all consistency reduce in the same measure the capacity for the other. If animals can be lacerated and killed without feeling much pain, it would seem that they must live without experiencing much happiness; and we are reduced to the Cartesian theory of animal automatism, or something closely approaching it. Thereby we divest the pageant of animal life of most of its significance, and this is just what the naturalist-writers on the whole seek to avoid.

Dr. Alexander F. Skutch, noted ornithologist and botanist, is well known for his scientific and popular writing in the field of the natural sciences. He lives, close to Nature, in Costa Rica, and has read and thought deeply about man's relation to other animal life. Dr. Skutch's philosophy with respect to this relationship is stimulating, and the discussion on these pages is presented in the hope that it will provoke thought and comment by our readers.

For my part, I frankly admit that the animate world, from the lowest protozoon up to the highest vertebrate, is full of strife and carnage, which is to all appearances accompanied by a volume of suffering inconceivably great. To me, Nature is always interesting and often beautiful, but at the same time terrible—so terrible, in fact, that many of those who ecstatically contemplate it through a roseate haze could hardly bear the vision if the mist were suddenly blown away to reveal the natural world in its stark nakedness. Those of us who write or teach about Nature should look upon it as our duty to point out its terror no less than its beauty and interest. Only so shall we guard against the future bitter disillusion of those whom we influence.

But this harshness of Nature, far from invalidating human compassion, gives it all its significance and grandeur. What would be the use of compassion in a world so ordered from the beginning that strife could not arise among its creatures, in a world where pain and misery are intrinsically impossible? It is just the presence of suffering that imparts value to compassion; and the more strife and pain the world contains, the more precious compassion becomes. It will be recalled that Buddhism, often called "the religion of pity," never denies the fact of suffering. Quite the contrary, its whole doctrine is founded upon "the truth of suffering," the first of the Four Noble Truths enunciated by its founder in his first discourse to his disciples. Just as an optimistic philosophy is but a flimsy doctrine if it has not squarely faced and assessed all the disagreeable truths that pessimism proclaims, so a compassionate attitude toward the living world is of little value if it deludes itself as to the magnitude of the world's sufferings.

What, then, is the origin of this compassion which, so far as we can know with certainty, shines forth only here and there in a world of conflict and pain, like a feeble ray of light in the blackness of a vast subterranean vault? Only two alternative explanations seem possible: either it is a development of Nature itself, or it was implanted in man by some Agent that stands above and beyond Nature. If the latter, then it would appear to possess the highest possible authority, so that to spurn or disregard this sentiment within us would be sinful and irreligious. But to take the contrary view, and regard it as a natural development, by no means divests it of its sanctity and claim to our respect.

Everywhere in the natural world we detect compensatory trends that prevent the upsetting of the natural order by an unopposed process and preserve the balance of the whole. Water, for example, contracts and sinks as it cools, with the result that in winter lakes and pools grow progressively colder through their whole volume. In freezing weather this would result in their conversion into solid masses of ice, with the immobilization of all the life therein, did not a contrary process set in at a temperature a few degrees above the freezing point. Further cooling expands rather than contracts the water, the ice floats on the surface instead of sinking to the bottom, and in deep rivers and lakes the great bulk of the water remains fluid and capable of supporting life. The widespread presence of compensatory trends in physico-chemical systems is recognized by the Theorem of Le Chatelier, a principle of almost universal application, which states that if we bring an additional force to bear upon a system in equilibrium, the point of equilibrium will shift in such a direction as to diminish the effect of this force.

I believe that in the growth of compassion we have an example of an analogous process in the living world, which is essentially a system in dynamic equilibrium. On every side we behold the uninhibited exploitation by living things of other living things, with no consideration for the feelings or purposes of these exploited creatures. But the exploiters have at best a low degree of intelligence, so that they can use these other creatures only in certain ways determined by their own hereditary organization; and in most instances the relations between exploiter and exploited, between predator and prey, have through countless generations of mutual interaction reached an equilibrium that permits the continued prosperity of both, as species if not as individuals.

But after long ages, a new force springs up in the world in the form of an animal far more intelligent than any which preceded it—an animal able to devise countless novel, ingenious, and often diabolic ways of exploiting its fellow animals. The equilibrium between

the forms of life, the whole system of Nature, might be overturned or utterly destroyed by this more cunning animal, did not a new factor come into play as a principle of limitation. The very intelligence that makes this animal so much more efficient as an exploiter admonishes it that it is wrong to press its advantage over other forms of life to the utmost limit. Its spontaneous feelings rise in revolt against the merciless exploitation of other animals. An inhibition springs up from the inmost depths of this intelligent animal and tempers its cunning with mercy. Compassion is born. This newly springing sentiment seems to represent Nature's effort to mitigate the strife that results from her own teeming fecundity, to outgrow the crude methods of the primal ages and bring a milder dispensation upon the earth. And if, in the manner that I have perhaps too hastily sketched, we view compassion as a higher development of a natural process, to which all the preceding stages of life are foundational and preliminary, it seems to me just as sinful and recalcitrant to scorn or smother the first faint glimmer of this new light in our breast, as when we look upon it as implanted there by some higher Power.

EN ROUTE

As dawn dapples dark shadows
upon the pavement
these terrapin travel tardily home.
Reptilian heads upthrust
haughtily
they inch their way across. . .
O driver (destructive
as the speed of your sleek machine!)
watch warily the winding road ahead!
Weave snakily around them, the innocent,
serene and proud.
Life however lowly is life!
and blood however cold bleeds red.
One driver, one road, one terrapin
wantonly slain!
(So uneventful an event: Worth scarce
a shoulder's shrug!)
Recurring thousands-fold down myriad traffic lanes:
One terrapin's casual slaying may tip
a delicate balance in nature's scheme.

Marjory Titus Greene

For a more detailed account of the natural origin of compassion, I can recommend the interested reader to a voluminous work by the Australian naturalist-philosopher, Alexander Sutherland. In *The Origin and Growth of the Moral Instinct*, he traced in great detail the development of moral attitudes from the relation of the parent animal to its young. Parental sympathy expands until, in modified form, it embraces not only unrelated individuals of the same species, but, at last, those of distinct species; and compassion is a product of this sympathy. Thus we seem to behold a sort of rudimentary compassion at work in the behavior of those birds which feed and sometimes even brood the nestlings of other parents, perhaps of distinct species, and of mammals which suckle the young of some other animal. But a developed compassion, conscious of its purposes, seems possible only where imagination is more powerful than it appears to be in non-human animals. Compassion is the flowering of a highly endowed mind, as cruelty is its foul perversion. As only a rational animal can talk nonsense, so only an animal capable of compassion can be deliberately cruel.

One further question sometimes troubles those who view with compassion the multitudinous creatures around them, and are eager to do the little they can to diminish the sufferings and increase the joys of all things that share with them the boon and the burden of life. When we contemplate the exceedingly complex interrelations among living things, we often wonder whether some intended kindly deed will not on the whole bring more suffering than happiness into the world. We see an ant drowning in a puddle and are tempted, like the dove in the fable, to hold forth a straw to which it can cling and be saved. But we reflect that the ant is a predatory animal and if it continues to live will kill other tiny creatures, so that in saving its life we doom other beings to death. Or we hesitate to brush aside the beautifully symmetrical web that a spider has spun across our path, yet recall that if we walk around instead of pushing through it, many a hapless fly or moth will fall into the snare. Or we are moved to return a fallen birdling to its nest, but remember that it will devour many an insect and many a worm. On the other hand, recalling a speculation of Erasmus Darwin, we might argue that by killing some large animal, even a man, we actually increase the sum of happiness in the world by providing subsistence for the innumerable maggots and other organisms that batten in the carcass.

To attempt to apply such a Benthamitic calculus to the pleasures and pains of the whole creation can lead us only into a hopeless muddle. It is very doubtful whether such a summation of pleasures is possible even within the far narrower bounds of a human society. By what scale shall we measure the agonies of an ensnared moth or the delights of a dining spider? All that the compassionate man can hope to do is to examine his acts in their more immediate effects, without groping to follow their repercussions to the remotest shores of life. The question he must ask is not "What can I do to diminish the sum of pain in the world?" but "What can I do to reduce the suffering for which I am directly responsible, or that which comes immediately to my attention?" When we perform a spontaneous act of charity, or refrain from some course that brings destruction to living things, we cultivate and satisfy a sacred impulse within us; when we take the contrary course, we thwart and violate this impulse. It is not our fault if the world is so constituted in its multitudinous interactions that nothing we can do will lessen by a single twinge the sum of its pains, or add a gleam to its aggregate happiness. Per-

haps fortunately for our finest impulses, we can never know this of a certainty. We can only hope that by lightening a burden here and providing a small joy there the total amount will be favorably affected, as in all probability it is.

But it is not so much by their positive acts as by their restraint that men most benefit other forms of life. It does not follow from this that the man who does most for the living world as a whole is the most passive and indolent. It is far from my intention to advocate such a doctrine of inactivity. As Gandhi taught, only the truly courageous man can succeed in the practice of non-violence. To desist from some cruel amusement in which all our friends indulge, to refrain from the use of some common article because its production entails great suffering to men or animals, often requires a degree of fortitude far from commonplace. To simplify our lives, to find modes of satisfying those of our basic needs which involve less destruction of living things, demands careful thought and an active inventiveness.

If I have touched in this paper on the sufferings of life as a whole, it is not because I believe it wise or wholesome to devote much time to brooding over them. The great systems of spiritual culture have generally had scant use for pity. They have taught men to bear with equanimity their own disappointments and inevitable pains; and what would be the use of this strenuous self-discipline if we were to be upset by all the miseries we can not help but see whenever we look around us? Such sights would agitate that calm and serene mind which it has ever been the goal of the wise to cultivate. Compassion is still at root a passion, or passive affection of the mind; and from Buddha to Spinoza, the great doctors of the spirit have recommended the subjugation of the passions. But when instead of brooding over suffering we do something to alleviate or remove it, we are no longer passive but active; and such activity is consistent with the highest nobility of the mind. This was the course of the Stoics, who deprecated pity yet cultivated the most effective philanthropy of the Classic world, and were largely responsible for the "golden age" of the Antonines. It is far better and more worthy of us to perform one smallest act of kindness than to spend a lifetime brooding inertly over the woes of all the world. And by such active measures we diminish the distress that the sight of suffering causes us, no less than the suffering itself. I believe that the wisest course is to pay attention to just so much of the world's distress as we can somehow alleviate. To distract our minds with the remainder is futile.

Thus when those of us who know compassion are reminded, sadly or mockingly, that Nature is "cruel," let us freely grant the contention. We may even allow the hard-bitten "realists" to paint the harshness of Nature in the blackest colors at their command; their portrait can not alter the quality of the original that it purports to represent. But it will be useless for them to deny the reality of compassion; we have felt it in our own spirits and there is excellent evidence that other men have felt it for at least 3000 years, and probably a great deal longer. Then let us ask our critics whether they regard this compassion as a natural evolutionary development or as a sentiment implanted in the human mind by a Power that stands above Nature and directs its course. If the latter, then they have invested this sentiment with the very highest sanctity, and even to speak disparagingly of it is impiety. If the former, then we must see in compassion an effort of Nature to transcend the crudities inseparable from the earlier stages in the development of life; and as such, too, it would appear to be authoritative as the latest and highest product of that aeonian movement which made us what we are. If it is still weak and of sporadic occurrence, we recall that all great things had small and unpromising beginnings; and against the background of possibly a thousand million years of life on this planet, human compassion is of very recent birth. If it has not yet sprung up in the spirit of our critics, or is still so faint that they can not detect it there, it is evident that, due to the unequal development so frequently observed in members of the same species, they are no less than one hundred generations behind the most advanced type of mankind—for which they, too, seem to deserve our compassion.

DOGWOOD IN SPRING

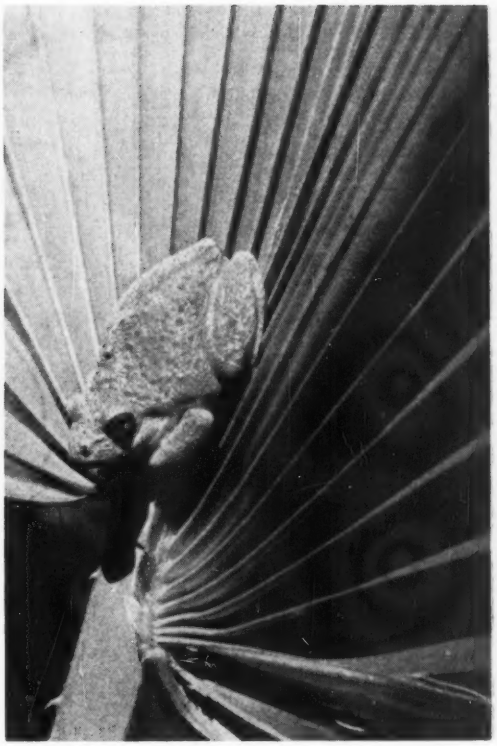
There upon the edge of every fluted petal,
The nail prints still are seen as burned in blood,
Remembering the Saviour's darkest hour
When, on a "Place of Skulls" three crosses stood.
His cross the dogwood trunk of sturdy fibre
Fashioned to bear His sacred weight with shame;
See where the snowy petals still bear witness;
Shaped like the cross, each flower upon the stem.
Still, lo, these many years, the bent tree sorrows;
Twisted in agony the slim trunk mourns;
There where the calyx rises from the blossom,
Each dogwood flower shows its crown of thorns.

Julia Collins Ardayne

A Little Frog with A Big Voice

By NELL MURBARGER

Photograph by the Author



WHETHER walking beside a seeping spring in southern California's desert mountains, or following a maple-edged brook in Canada or Indiana, one of the loveliest small joys of a canyon jaunt is to come unexpectedly face to face with a tree frog—the thumb-sized character with the king-sized voice! Riding the choppy air currents on a bobbing leaf, or clinging effortlessly to the lichen-covered bark of a tree, the rain-loving *Hyla* regards his woods visitor with bright, curious eyes, and a pert expression.

Occurring in practically every State in the Union, as well as most countries of the temperate and tropical world, members of the tree frog family (*Hylidae*) are readily distinguished by the small adhesive disks they bear at the tips of their fingers and toes. Like certain lizards and fishes, some members of the *Hylidae* also possess the ability to change color.

Unloved Thornapple

By RALPH J. DONAHUE

Photograph by the Author

ALTHOUGH the thornapple, or Jimson weed, may have few friends, it does possess a rugged quality that is pleasing to see. Its foliage is a rich, dark green, and its large, white flowers, plaited and trumpet-shaped, are arresting. Opening, as they usually do, in late afternoon, or early evening, the blossoms have a charm not always appreciated by the average beholder.

The fruit of the Jimson weed, in most of the several species found in this country, is a spine-covered burr that ripens upright on its stem. Both the fruit and the ill-smelling plant, if eaten, are highly poisonous to animals.

The member of the Nightshade Family pictured here growing in Kansas is a variety of the more common, green-stalked, white-flowered Jimson weed, *Datura stramonium*. This variety, *tatula*, has a purple stalk, and flowers that show much lavender. Both are immigrants from Asia, and both are now naturalized here.

Operation Diana

By LEONORE BRANDT

Priscilla, the motherless Diana monkey, at twenty-seven days was a quaint little creature and seems to be wondering what life is all about.

PHOTOGRAPH BY THE AUTHOR

BIRTH of a baby to the Diana monkey pair at the Cincinnati Zoo, on May 8, 1950, was an event about which apprehension was mixed with excited pleasure. A year before, the couple had had their first offspring, but it was killed by its mother when it was three months old. The unexpectedly vicious attack by the female destroyed the hope of the zoo's officials to raise, for the first time in the United States, a Diana monkey born in captivity. These most beautiful members of the large African guenon group do not take kindly to captivity in general. Offspring are rarely born to pairs and these die in infancy.

This second infant was two weeks old when tragedy again struck. This time the mother Diana became suddenly ill, dying after a few hours. When the news that the female was failing reached the Children's Zoo, of which I was at the time Curator, I rushed to the front office and asked Zoo Director John F. Heusser to let me adopt the orphan. "If you promise not to be too heartbroken when it doesn't live," answered Mr. Heusser. "It would be quite an accomplishment to raise the first captive-born Diana. Much luck to you."

The skinny, crying infant was a pitiful sight, and my heart went out to it. Its wide-open eyes had not yet learned to focus. When I tucked it under my jacket, the crying stopped immediately. With a sigh the tiny creature went to sleep. My next step was urged by pure sentimentality, I confess, but resulted in important knowledge about the baby's first two weeks. I went to visit the dying mother to let her see that the baby would be well cared for. The two Dianas had always been my favorites in the monkey house, and I was proud that these aristocratic primates returned my friendship. My voice brought recognition to the clouded eyes, and when I petted the female she drew closer to my hand. It was then that I discovered that her breasts were barren, and that she had been unable to nurse her baby. This explained why I had seen the infant sucking from an orange when only two days old. A strong will for survival must have caused this precocious action.

PHOTOGRAPH BY THE AUTHOR

At twenty months the red rubber pipe is the Diana's favorite toy.

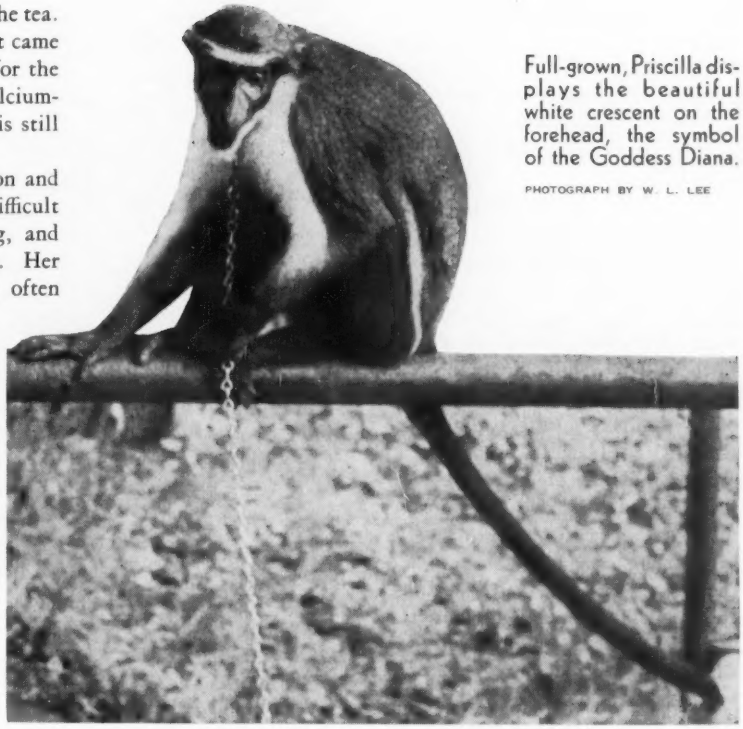
Arriving home, I converted a brand-new cat carrier into an incubator, installing a hot water bottle and soft towels. Before I placed the baby in the carrier, I examined and measured the little monkey, and made the first entry in its diary:

"May 22, 1950: Just received two-week-old female *Cercopithecus diana*. Head and body length, three and one-half inches; weight, five ounces. Head and back are covered with dark, down-like hair; chest and shoulder naked." Midnight: "Milk not tolerated. Slightly sweetened tea and mashed bananas accepted greedily. Named Priscilla."

Priscilla's dislike of milk presented quite a difficult problem. Her stomach could not keep it down, and even its smell seemed to be disagreeable to the baby. I

tried to smuggle a few drops of milk into the tea. Priscilla drank this readily enough, but it came back after a few minutes. To make up for the lack of milk in her diet, I gave her a calcium-vitamin-mineral preparation, which she is still taking steadily.

No royal baby could get more attention and better service than did Priscilla. Such a difficult infant needed the most careful planning, and "Operation Diana" was soon on its way. Her incubator was lined with sterile cloth, often renewed, and my hands got rough from incessant scrubbing with surgical soap. But the most difficult thing was to add just the right items at the right time to her diet. During the first seven weeks I had to get up every two and one-half hours at night, being awakened by Priscilla's crying. Although I was aroused from deep sleep, the cries were music because only a live baby can cry.



Full-grown, Priscilla displays the beautiful white crescent on the forehead, the symbol of the Goddess Diana.

PHOTOGRAPH BY W. L. LEE

Priscilla made the daily trips between the Children's Zoo and our home in her makeshift incubator. No other animal in our collection ever aroused the public interest and sympathy as felt for this Diana orphan. Her large brown eyes set in a pointed little face made a wistful expression that appealed to young and old. I still remember the bank executive who visited the Children's Zoo every morning on his way to the office, just to get a glimpse of Priscilla. And one woman told me emphatically: "Don't drive fast, Mrs. B., and be careful when you cross the street, that little monkey surely needs you."

In the second half of July, I placed Priscilla on exhibit in a small, glass-fronted cage, but only for about thirty minutes at a time. She played with a baby rattle and a tiny rubber elephant, and soon learned to balance herself on a large rubber ball. She did not pay any attention to her adoring audience, or to the other animals. She lived in a world of her own, into which I alone was admitted. When she sat on my arm, and somebody walked close by, she stiffened and pressed her face against me. She closed her eyes tightly so that she would not have to look at the intruder into her privacy. She was almost three months old before she admitted my husband into her world for the first time, by climbing up his legs, and sitting on his lap for a few minutes.

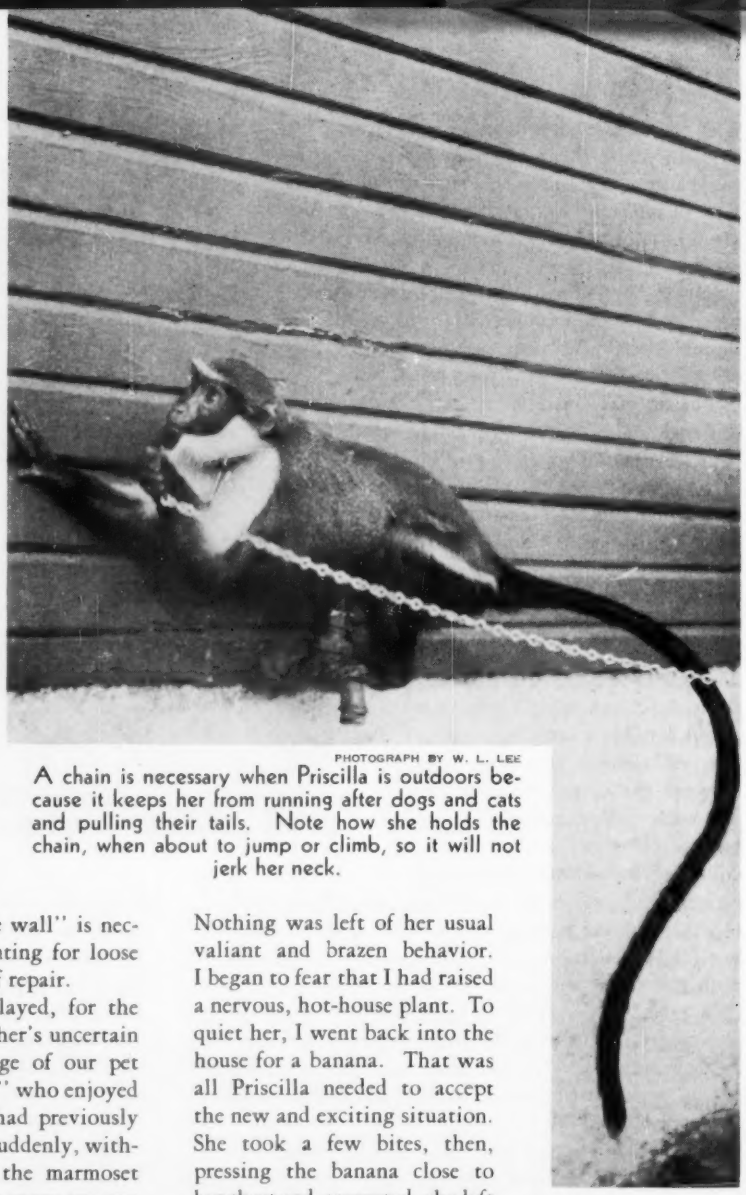
Her development and behavior was in interesting contrast to that of a baby Rhesus monkey, who had also lost his mother and had become a resident of the Children's Zoo. Although he was only about seven weeks older than the Diana, he was an independent, cheerful youngster able to take care of himself. Comparing these two monkey children with each other, and studying daily their mental and physical progress, it became apparent that the problem of keeping Dianas successful in captivity is mainly psychological. "Plucky," the little Rhesus, was a happy-go-lucky extrovert, who thrived on good food and friendly treatment. Priscilla grew much more slowly, and with great dependence upon her foster mother. She also showed a definite need for routine, and things had to be done in a once established way. From the beginning I held her in my left arm, feeding her with my right hand. Once she was sitting in my right arm, so I tried to feed her with my left hand. Priscilla stiffened, her usual sign of displeasure, and would not accept the food until she had wedged herself into my left arm, my right hand again holding the spoon. This is just one example out of many incidents.

As soon as the Diana began to take notice of the "world around her," I began to utilize her need for ritual to make her feel loved and wanted. I established a weekly "birthday party," which was celebrated every Monday. I would sing "Happy Birthday," and present her with a little toy, colorfully wrapped. She enjoyed these parties very much, and established a never-varying pattern for them. The moment I sang "Happy Birthday" she would look for the gift. Then she unwrapped her present, looked at it, and put it aside to play first with the wrapping paper and ribbons.

When Priscilla was one year old I switched slowly to a bi-weekly birthday party, and after she completed her second year we celebrated only once a month. Once she proved that she has an ear for music. On the radio a few voices sang "Happy Birthday." Priscilla listened in surprise, then turned an inquiring face to me as though

to ask: "Why don't you sing? Where is my present?" I hurriedly brought a red, rubber pipe, which I had prepared for her twenty-months' birthday party, then only a few days off. Thus our good relationship remained undisturbed.

At sixteen months Priscilla developed a hobby. She began to collect buttons. First there was nothing unusual about her interest in buttons, because I have never seen a monkey that did not display a lively interest in them. It was just annoying that she skilfully took all the buttons off my smocks, biting through the thread. So I had zippers put in every garment I wore in her presence. Priscilla examined the zippers carefully, and seemed to be forever looking for buttons. When I discovered she had saved the pilfered buttons, and hidden them in a hole in the wall of her room, I realized she was a hobbyist. So I bought a few dozen buttons at a sale, and sewed them lightly to my smocks to give her the pleasure of adding new items to her collection now and then. Maybe a short explanation about the "hole in the wall" is necessary. Priscilla spends many hours hunting for loose plaster, and her room is always in need of repair.



PHOTOGRAPH BY W. L. LEE

A chain is necessary when Priscilla is outdoors because it keeps her from running after dogs and cats and pulling their tails. Note how she holds the chain, when about to jump or climb, so it will not jerk her neck.

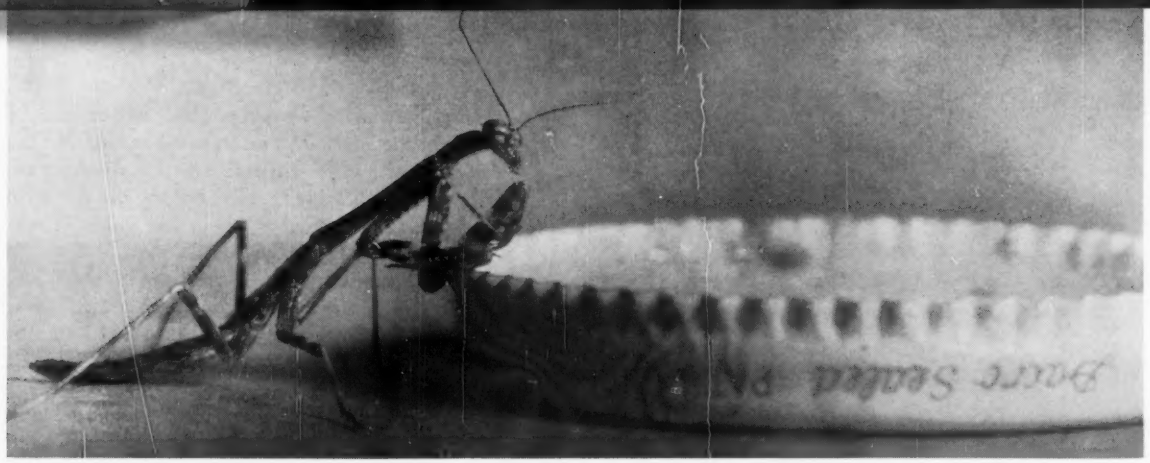
When four months old, Priscilla displayed, for the first time, that she had inherited her mother's uncertain temperament. She climbed into the cage of our pet marmoset, an elderly female named "Susi," who enjoyed the company of the little Diana as she had previously the visits of a young Capuchin monkey. Suddenly, without any provocation, Priscilla grabbed the marmoset and threw her off the perch, and mixed her angry screams with Susi's frightened ones. It was not easy to separate her from her innocent victim. After that I kept Susi's cage tightly locked.

Priscilla always felt sorry for herself when told not to do something. The gentlest "no-no" brought her, crying, to hug me around the neck, or she hugged herself by folding her arms over her chest. Since she is so easily excited, I prefer to tell her, "Everything is all right." This makes her stop much faster than "No-No, do not do this." She reminds me often of the customer who always has to be right, no matter how wrong he may be.

Priscilla accepts a large variety of food, but the banana has still a special meaning to her. Remembering the greediness with which she accepted the mashed banana after the first two weeks of near starvation she had spent with her barren mother, it is easily understood why the banana has become a symbol of security to her. The first time I took the growing monkey child for a romp in the garden, she clung to me with fright in her eyes. Nothing was left of her usual valiant and brazen behavior. I began to fear that I had raised a nervous, hot-house plant. To quiet her, I went back into the house for a banana. That was all Priscilla needed to accept the new and exciting situation. She took a few bites, then, pressing the banana close to her chest and, reassured, she left my shoulder to climb in the branches of a huge, old maple tree.

I have no way of knowing whether the data I gathered on the rate of growth, maturing, and teething in the Diana are the same as in the wild, but I assume that they come pretty close. At two weeks Priscilla had eight small teeth, the four upper and four lower incisors. At twenty months the first set of teeth had completed growth. At twenty-seven months the permanent teeth began to grow in. The two upper middle incisors, as in most monkeys, grew in behind the baby teeth, and the latter did not fall out until the permanent teeth were quite large. The complete change of teeth was drawn out over more than a year. The so-called canine teeth were the last to appear, and their arrival coincided with a certain mental maturity.

At four and one-half years Priscilla stopped growing, and her food intake decreased slightly. Her head-body length today is eighteen inches, (*Continued on page 159*)



"Rosy III" is about to dip into her water fountain, which is the cap of a milk bottle filled with water. Below, at the left, for sake of comparison, is a praying mantis, distinguished by lack of lacy wings, its greenish-tan instead of brown color. different eye placement and other details. At the right is inch-long "Rosy III." Note her mantis-like head and fore-legs entitling her to be called a "false mantis."

The Diary of the Rosies

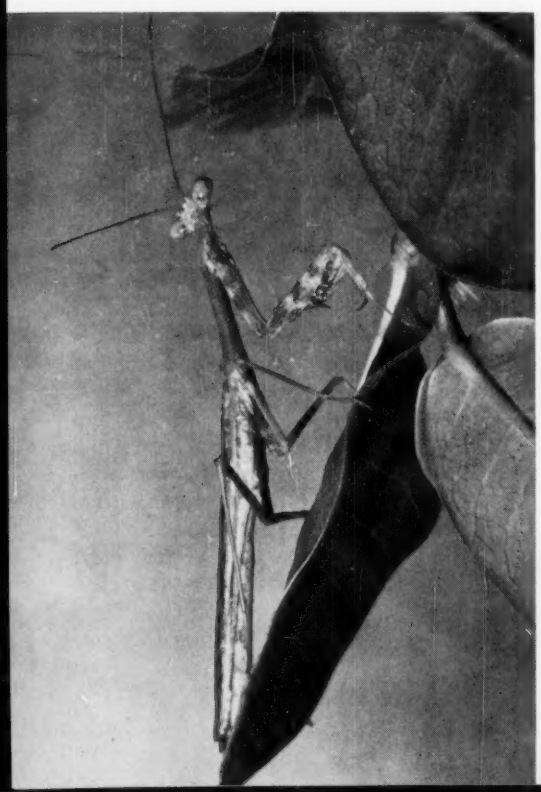
By HELEN A. ROGERS

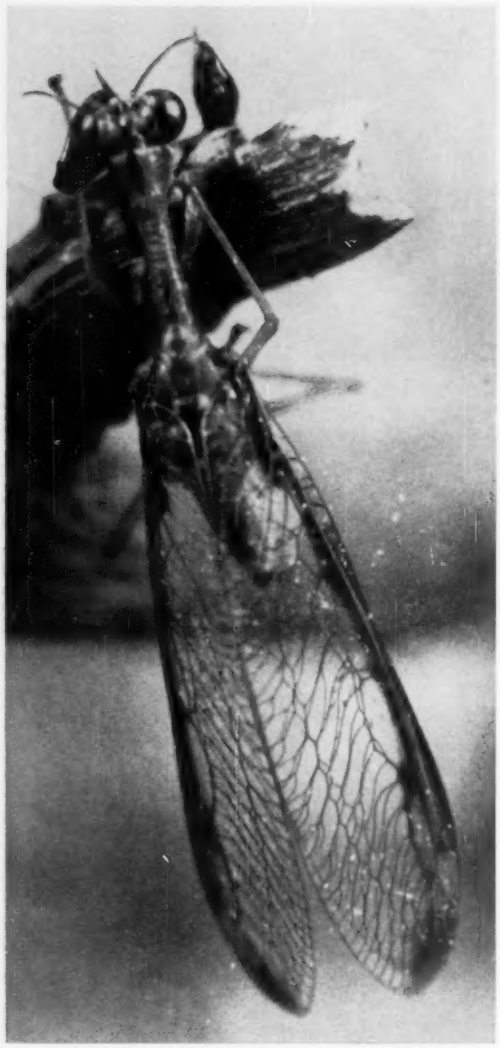
Photographs by the Author

October 24—I saw the first "Rosy" when a friend of mine brought her to me on the windshield of her car. She had found the "baby mantis" stalking prey there and had driven the mile or so from her home, at tortoise speed, safely to deliver this rare addition to my Nature gallery.

Little did I know then how rare this tiny baby was. For it was not until much later that she was identified as a *Mantispa brunnea*, one of the two species of Mantispidae with any considerable distribution in the United States. Despite her looks and name, the Mantispa is related to the Dobson-fly and, unlike the mantis, goes through a pupal stage.

But to get back to when I first saw her. Scarcely an inch long, her forelegs were brownish and her abdomen, pinkish. Her lacy wings, dragon-fly-like, were rose. So she was promptly dubbed Rosy and popped into a bottle cage for observation and for her future protection.





Here the lacy wings of *Mantispa brunnea* are shown, being a sure way to know that she is not a mantis.

Inside the bottle I could get a clear view of her mantis-like forelegs. They grew straight out from her head to the elbow, where the spines or choppers began. Then came the spears or hooks; and at the tip end were the slender feet that she used for walking and climbing.

October 27—A moth was caught and put in Rosy's jar. She made only the merest attempt to stalk it. I had to thump the jar and get the moth to flying about. When it got too close Rosy would make a grab, hacking away with her claws. She managed to tear off a leg, which she wasted no time in wolfing down, holding it in one pincer, biting off chunks rather than chewing; holding the leg as though it were a drumstick.

At the end of her snack she began cleaning up. First her claws; then her mouth; then she started combing her head with her claws.

Now she was ready for more hunting. When the moth began fluttering again, although she was not facing it, Rosy commenced shadow-boxing. After five minutes or so she caught the moth. A violent tussle ensued, but the moth finally got away. All this time Rosy's short antennae had been vibrating rapidly, but she did not seem to know what was going on about her unless it was right under her nose.

October 28—Ixora leaves were sprinkled with water and put in Rosy's jar. She fell to at once. Whether it was for the water or the load of aphids, or both, I am not sure. Stretching her hind legs, she supported herself with her second legs. Her forelegs she folded down, for they were useless for this kind of meal. Every once in awhile she would unfold them, hinge-like, as though she were taking out the kinks. Her antennae continued to vibrate almost constantly and at a rapid rate.

At 11:15 p.m., Rosy II was discovered on the outside of a house screen. She was given her own bottle cage.

October 30—Rosy I was presented with another moth. She ignored it. Then I followed with an experimental bill of fare. A June beetle was introduced. Rosy did battle a couple of times; then gave up. Unfortunately, the beetle in its panic kept circling about the jar and bumping into Rosy. She tried flailing at it; then started to fly out of its way. The beetle was removed to prevent injury to Rosy.

Next I tried her with a live mosquito. She showed no interest at all, but continued shadow-boxing. Next came a live tick; with the same result; no notice.

October 31—Rosy I, brought in from the dark to the light, was seen devouring the moth. The moth's head was gone and Rosy was buried to the eyes in the body, holding to it with both claws. Nothing will deter her now, not even jerking the bottle up and down; to the light or from the light. The moth is dead but, as Rosy eats, its front legs move as though the inner controls were being touched. Haunting.

November 13—Moths have been rather scarce the past two nights so in the morning I put a couple of ants in Rosy's cage. She struck out at one, got it, and gobbled it down. The second ant got jabbed at but not caught. However, not being in too healthy a condition when put into the jar, it soon succumbed. I did not see Rosy eat it, but a few minutes later it was gone. And much later, so was a third ant.

That night a large carpenter ant was caught. Rosy feinted at it. Then suddenly she began getting out of the ant's way, whirring her wings at top speed.

Rosy II seems not to have the spunk No. 1 has; but more temperment. II stabbed her ant, but refused to eat it as long as I watched. I left. When I came back in a few minutes, she was eating. Suddenly she stopped. Because she saw me? I do not know. But when I turned her jar so her back was to me, she began eating again. Reversing the jar so she faced me, she stopped eating.

The Rosies hold their victims in both claws, sometimes with one on top and the other under; and sometimes with both on top. They support themselves with their second and hind feet and the body of their prey. The elbows of their front legs never touch the ground

while they are eating.

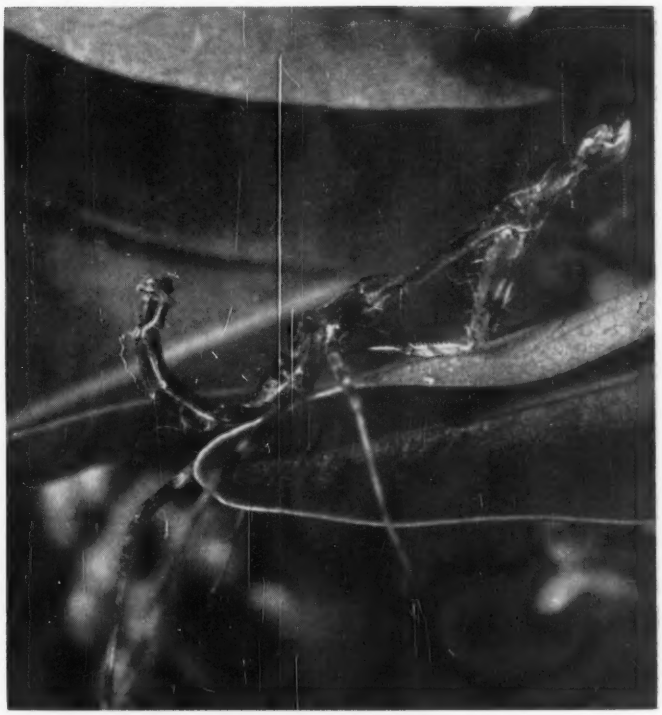
November 14—Rosy II has been doing some flying lately, whenever I tip her cage or put my fingers inside it. At one time she buzzed for almost a full minute.

In the morning Rosy I hooked another ant and got it clamped between her claws. But she did not eat it. She acted as though she was carrying it around until lunch time.

Then at 1 p.m. I found her on her side. She was still clasping the ant, but she was gasping for breath. I removed her from the jar. Her abdomen began curling and her hind legs twitching. I took the ant from her claws. Rosy seemed to be in a coma. A short time later she died. Why? Had the ants she had eaten poisoned her?

November 19—Rosy II succumbed. I do not know why except that it might have been from too much shaking up, or too much confinement.

It was after this I found out something about the mantispids. I learned that primarily they eat small spiders and their eggs; that the adults lay their own eggs on the tip of a long stalk similar to the lace-wing flies' laying; that when the larvae hatch, they search out egg cocoons of certain spiders and pierce them and go inside. When the young spiders are about to hatch, the mantispids eat them. This goes on until they emerge from their own cocoons, which are white and spherical and silken with a lid-like top. The young mantispa go through two molts.



This looked like one of the Rosies but was only a shed skin. Note how perfectly the insect "skun out."

December 13—Rosy III discovered! She was a visitor, unawares, for I thought I was only bringing in a spray of day-blooming jasmine to use as a prop for photographing a tomato caterpillar taken over by parasite cocoons. It was not until the whole setup was under the flood lights that Rosy III popped into view. I had learned my lesson by this time. III was allowed to roam where she willed.

For the next few days she was seen most of the time. Sometimes she got momentarily lost but soon she would show up again, usually near the ceiling light globe, awaiting the small insects attracted to the light. Unconfined, I could see that it was III's habit, at least, not to stalk prey so much as to wait until it foolishly chanced by.

Once when she was lost I found her on that same jasmine branch. Or I thought I had until on closer inspection, I saw it was just a "skeleton" of her old self. It was a perfect "ghost" including hooks and tail turn-up.

December 26—I decided III must be provided with a drinking fountain, if not bath. All the Rosies kept busy keeping clean but they seemed to prefer the dry-cleaning process by which they brushed with their legs and combed with their claws. I filled a bottle cap with water, and set III in the fountain, or more precisely, pond, so that only her rear legs were out on the rim. After a few minutes her face and forelegs went into the water.

I watched closely. But there was no sign of any mouth movement. I waited a few more seconds. She looked so strange. Had I drowned her? I touched the tip of her body. Up she reared; and began fancying herself.

She dipped into the water again, this time with her forelegs folded, as though she were resting on inverse elbows. Still I could see no mouthing. I thought she must be drinking and hurried to put a magnifying glass on her. She stared back boldly.

I saw she had white stripes on her legs. But I did not see her drink. Does she suck in without any visible outward sign?

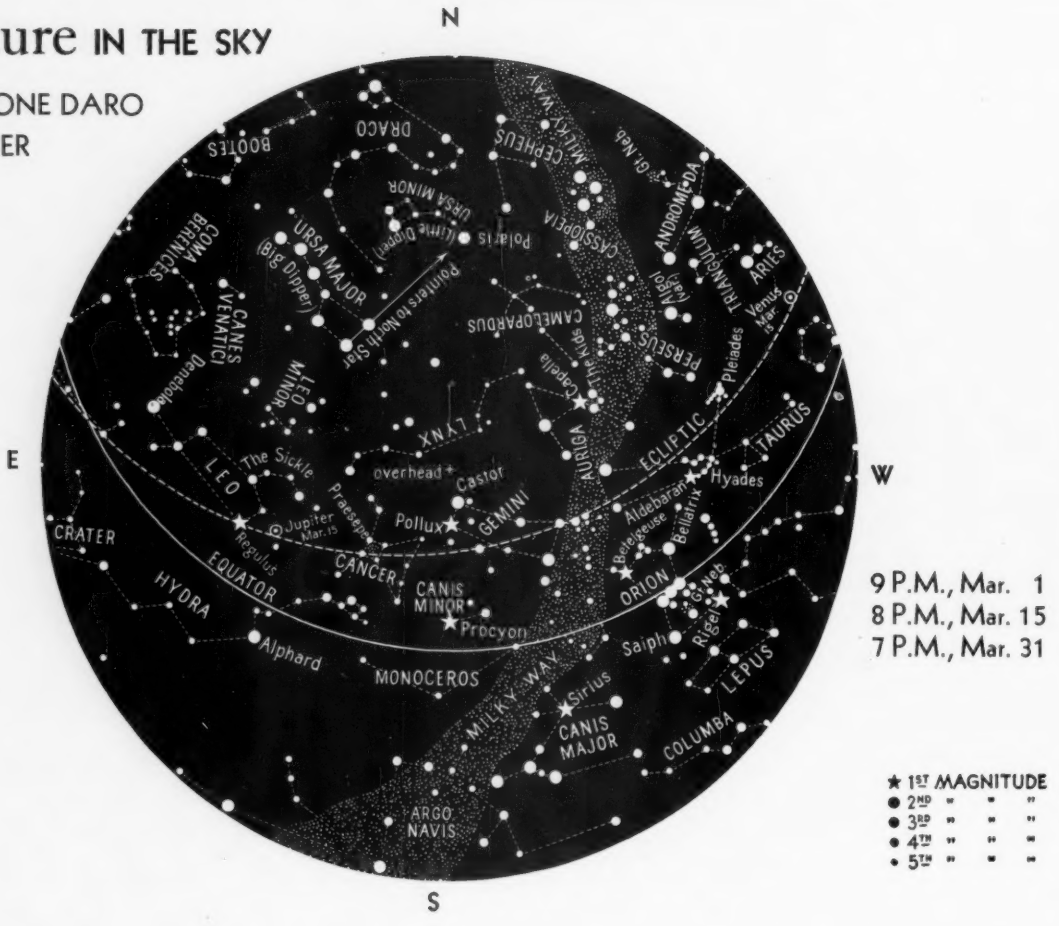
She was unafraid and curious. She would come at me, moving her head from side to side. When she stopped, I would begin to sway; and she would start in again.

I can not imagine how I looked to her on the other side of the magnifying glass but it did not frighten her any. She came on bravely, crawling up the surface of the glass to the top rim. There she commenced her head-weaving. Then suddenly she stopped, and leaped at me! I jerked away and she landed on my wrist, and sent a claw out at me. An inch-long Jack the Giant-killer. Her tiny feet could scarcely be felt. But her forelegs pin-pricked.

But, alas, III's fearlessness was (*Continued on page 162*)

Nature IN THE SKY

By SIMONE DARO GOSSNER



9 P.M., Mar. 1
8 P.M., Mar. 15
7 P.M., Mar. 31

To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. Times given are for Local Standard Time.

COMETS

THE APPEARANCE of a bright comet with a full sweeping tail blazing across the sky is an event so rare and so spectacular, that it never fails to capture the imagination of those who witness it. Historic chronicles have made careful note of their occurrence, and records of the passage of bright comets go back several thousand years. Their true nature, on the other hand, remained a puzzle to mankind until the latter part of the sixteenth century. Until then they were thought to be emanations from the earth's atmosphere. They were sometimes credited with supernatural powers and if, perchance, they appeared at the time of some historic event, they were often taken as an omen of whatever might ensue and man's imagination was apt to run riot.

From his observations of the great comet of 1577, the Danish astronomer, Tycho Brahe, came to the conclusion that it must lie beyond the Moon's distance, and thus could not possibly be an atmospheric phenomenon. The only alternative was that a comet belongs to the solar system. This discovery aroused considerable interest among scientists of that epoch. Their attention focused in particular on the seemingly erratic character of a comet's motion. The speed is variable, the direction haphazard, and the orbit is not confined to the zodiacal belt, as are those of the planets. The problem was not solved until Halley, more than a century later, in 1705, published his treatise on comets.

Isaac Newton had recently propounded his theory of

gravitation. Basing his computations on Newton's theory, Halley computed the orbits of twenty-four known comets. Noting a striking similarity between those of 1531, 1607, and 1682, he concluded that they must have been reappearances of the *same* comet and predicted that it would return in 1758. "Halley's Comet" did, indeed, reappear in that year, a triumphant vindication of Newton's laws. Halley, unfortunately, did not live to see his prediction fullfilled.

Subsequently, historians have found that Halley's comet had been observed many times in the past. Thanks to Chinese and Japanese chronicles, in particular, we have records of every appearance, save two, since 467 B.C. It was seen during Attila's defeat at Chalons-sur-Marne in 451 A.D., and also at the Battle of Hastings in 1066. It was recorded for the first time in the North American settlements in 1607. Its last appearance occurred in 1910, and its next expected return is in 1986.

The difficulties involved in computing a good orbit from several observations of the same comet are twofold. The path is highly elongated, submitting it periodically to the attraction of the larger planets. The resulting perturbations modify the orbit at each return of the comet, and must be taken into account in a precise computation. On the other hand, these objects are fuzzy and asymmetrical in appearance. They have no sharply defined nucleus, and it is correspondingly difficult for the observers to measure its exact position. We must remember that a computed orbit refers specifically to the position of the center of gravity of the object. The observer must rely on his own judgment to decide where this center lies in such an irregular object.

No two comets are exactly alike in appearance. While they are still far away from the sun, they have usually a bright *nucleus* embedded in a nebulous patch called the *coma*. As a comet approaches the sun, the outward pressure of the solar rays (the so-called radiation pressure) pushes the material away; the coma diminishes in size, the brightness increases, and a *tail* begins to form. The tail may assume many shapes, but it always points away from the sun, reaching sometimes enormous proportions. The longest tail on record is that of the great comet of 1843, which developed a tail almost two hundred million miles in length—twice the distance from the earth to the sun. The tail eventually disintegrates as the comet returns to the confines of the solar system, and the material that went to form it is irretrievably lost.

As this disintegration process takes place at each return, and may be repeated for many centuries, even the brightest comets fade out eventually until they can no longer be seen. Even Halley's comet is believed to have faded about two magnitudes in the last thousand years.

The mass of a comet is incredibly small, only a few one-billionths of the mass of the earth. Percival Lowell once described it as a "bag-full of nothing." The material is so tenuous that the earth has passed many times through a comet's tail without any observable effect, except perhaps for a faint auroral glow. The nucleus is an aggregate of solid particles similar in composition to that of meteorites. The coma and the tail are formed by the gases that escape from the solid particles as they are heated up by solar radiation. There is no record that the earth ever collided with the nucleus of a comet, but, if we ever should, all that we may reasonably expect to see is a spectacular meteor shower.

Continued observations of comets, both for the purpose of determining their position, and to ascertain their composition, are essential to furthering our knowledge of the subject. A minimum of three accurate determinations of positions taken a few days apart are required to compute a preliminary orbit. The more observations are available, the more accurate the orbit will be. For that reason astronomers everywhere communicate telegraphically their discoveries and subsequent observations by means of an international clearing house. The Royal Observatory at Copenhagen, Denmark, assumes the task of relaying the information to Europe and Asia, while Harvard Observatory performs the same service for the Western Hemisphere.

Each newly observed comet is designated provisionally by the current year, followed by a lower-case letter, in alphabetical order, and the name of the discoverer. For example, 1940b Whipple was the second comet reported in 1940. After their orbits have been computed, however, the comets are renumbered in order of their perihelion passage—that is, their nearest approach to the sun—and a Roman numeral is used. Following the rule, 1940b Whipple became 1941 III, as it did not come to perihelion until the next year. If the comet returns, and its periodic nature is thus established, it then receives the prefix P/. Comet Whipple is now described fully as 1941 III P/Whipple.

In 1956, no less than nine periodic comets will be available for observation. Seven of them, unfortunately, will be too faint for any but the largest telescopes. Of the other two, 1955c P/Ashbrook-Johnson, will undoubtedly be kept under observation throughout the year, while 1928 III P/Crommelin (*Continued on page 162*)

MY SON, AGE ELEVEN

Plans a rendezvous with Venus;
Thinks he'll some-day land on Mars!
When he zooms his rocket outward
On a journey to the stars!
Says in time he'll build a space-ship
To surpass the other guys;
With his scientific research
Circumnavigate the skies!
As for fuel he'll store the sunlight,
Plans to build a tank real soon,
Says he'll build a half-way station
In the craters of the Moon!

But, tonight, I tucked the bedclothes
Round his slender, boyish form,
And my prayer went winging upward,
"Father, keep this lad from harm,
Till he sees that days are precious. . .
Life well-lived is good and wise.
God, let him dream awhile unknowing
Thou alone can chart the skies."

Lois Anderson

Nature IN THE SCHOOL

By E. LAURENCE PALMER

Professor Emeritus of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

Lilies in School

IF THERE IS ANY MONTH in the year when school rooms will have some plants in them it is the month before the Easter season. This article should precede Easter by about a month, and it is hoped it may help teachers make the most of the flowers on their window sills.

As a rule the flowers found in pots on school room window sills are making their last appearance. After the flowers have faded, the plants may be abandoned, left unwatered and thrown out. The chart section of the insert in this magazine may suggest how these plants may be saved, or at least how teachers may take bulbs from the store or earth in the fall and bring their own plants into bloom. Such a practice should be of much greater value educationally than merely going to the florist and buying some more potted plants when the need arises.

Remember that after your lily bulb has produced its flowers it has rather well exhausted the food reserve in the underground part of the plant. It must have time and opportunity to recover. Since this happens usually about the time when weather conditions outdoors are getting mild, it might be well to transfer your plants from their pots into some good garden soil. There they may have a good supply of sun and be able to take care of themselves. This should probably be the simplest thing to do, and probably the most sensible. If the top of the plant dies down in summer that is all right, particularly if you have marked the spot so that you can dig the bulb up in the fall and possibly make a start at getting a new bloom for next year. In doing this I am sure that the chart section of the current insert will be useful.

Reaction is sought

In the present insert we have introduced two new items. I hope that we can get your reaction to them to guide us in the future. Are you interested in data on the suitable acidity of the soil for different plants, and are any of you interested in data on the number of chromosomes for each species? I am sure that fewer would be interested in the chromosome number than in the acidity because the study of the nucleus of the cells of plants is much more advanced than the study of the suitability of the soil in which the plant grows. Still there may be some high school biology teachers who would be interested in this information. If enough of them let me know of their wishes I will be glad to include it.

Scientists have found it convenient to express acidity of soils concisely. They do not say that a soil is very acid or sour. Nor do they say it is very alkaline. Instead they give the pH for the soil. The higher the number after the pH the less acid is the soil, as most science teachers already know. Plants found growing on limestone could not be expected to be grown in acid soil. Such minimalkaline soils are given a rating of pH 7 to 8. The plants found growing in such soils might well include ginger root, dutchman's breeches, *Hepatica acutiloba*, bloodroot, big-flowered trillium, and big-flowered bellwort.

Effect of limestone

Where limestone is present in reasonable abundance, but well mixed with other materials, we may have what might be called minimacid soils with a pH 6-7. Neutral soils have a pH 6-8; subacid soils, such as old fields, marshes and woodlands, where limestone is lacking, may have a pH 5-6. Medium acid soils with a pH 4-5 are to be found in peat bogs in evergreen forests, where rhododendrons and trailing arbutus may grow. Superacid soils with a pH 3-4 are to be found in peat bogs where sphagnum moss may be abundant. Some of the index plants for these types of acidity might include wakerobin, foam flower, flowering polygala, wood betony, *Hepatica americana*, wild geranium, adder's tongue. All these favor soils with a pH 5-6. *Clintonia*, wild lily of the valley, dwarf cornel, painted trillium, jack-in-the-pulpit and trailing arbutus are usually found in soils with a pH 4-5. Teachers might like to ask children who must collect wild flowers that they keep lists of the flowers they find growing as neighbors to each other. This may start an interest in soil acidity, and if this is started the data on this sort of thing in the chart section will be welcome. If I do not get a good response on this suggestion I will not include this information.

Some teachers feel they must go around in circles to tell children about the birds and the bees. Certainly much that is told on this subject, even by many science teachers, is far from the truth. It is almost safe to say that most writers of elementary science texts show little evidence that they understand the subject. Certainly if they did they would not say that the stamen of a flower is male and that the pistil is female. As a matter of fact they are neither. The male element is borne in the pollen, which the stamens produce, but the stamen itself is wholly sexless. Under these circumstances it might well be safe to speak of a lily stamen as being without sex, and so a suitable subject for discussion in any audience.

Similarly the pistil of our flowers is sexless, even though it does produce eventually the structure that bears the female element. Those who are known as cytologists study cells, and can show us that the cells arising from the union of the male and female elements in a plant have twice as many chromosomes as are to be found in the cells of the stage that produces the sexual cells. We have, then, the x and 2x number of chromosomes in the gametophytic and in the sporophytic stages of a plant's life cycle. The cells in most of the plants that we see most commonly have the 2x number and are sexless. The cells with x number in our flowering plants are for the most part hidden in our common plants. Since, when sexual reproduction takes place, the chromosomes in the male element join with the chromosomes of the female element it is necessary that the chromosome number in each be the same or some chromosomes would be left ununited. We cannot explain this story here but it suggests one reason why the chromosome number is important to know and explains most superficially why I put it in the chart in this insert. If you wish it included in the future let me know.

Diana

(*Continued from page 152*)

measured with flattened spine, the length of her tail is twenty-eight inches, her sitting height fifteen inches, overall reach three and one-half feet, and her weight fourteen pounds. But her strength is indescribable, far exceeding her actual size. If she sets her mind to it, she can bend an iron rod into a pretzel. I have never seen her use or fashion a tool, and she rather relies on her strength and imagination in reaching a desired goal. One time, for instance, I tried in vain to open a metal box with a tightly stuck lid. Priscilla grabbed the box, threw it on the floor, and the lid flew off. On another occasion I tried to separate two links of a magic chain ring, which neighbor kids had lost in our yard. Priscilla watched with interest, and I handed it to her to play with. She examined it for a moment, then took it apart by sliding the two rings against each other, which, by the way, was the correct thing to do. She removes screws and nails with her teeth and fingers, after first loosening them by shaking.

Daily grooming played a large role in Priscilla's well-being, but not until she was three years old did she return this social courtesy. Today, it is just as important for her to groom me, as to be groomed by me. She inspects my skin carefully for the slightest scratch or scab, and then she works happily at it. The social function of grooming is still often misunderstood by the zoo-visiting public, and erroneously taken for "bug-hunting."

One day I took Priscilla to a large meadow, thinking she might enjoy catching grasshoppers. The moment we left the trees and came into the open field, she grabbed my neck and shoulders tightly, and tried to push me back under the protective trees. Although born in an American zoo, she has the wisdom of her wild forefathers, and the Laws of the Jungle are known to her. You are safe among a densely growing vegetation, but a helpless target in an open field.

Adams Library

During his lifetime, Dr. Charles C. Adams, who passed away in April, 1955, at the age of 82, built up an outstanding library on the subject of ecology. He was a past president of the Ecological Society of America and one of the world's foremost ecologists. The entire library of books and pamphlets has been presented by his daughter, Miss Harriett Adams of Albany, New York, to Western Michigan College at Kalamazoo, Michigan, which thus will become a leading center for ecological information.

Litter

Thirty million dollars is the annual bill for collecting roadside litter left by the American public, says the American Automobile Association. This does not include the in-city expense of cleaning rubbish dropped on streets and curbs. The Association urges strictly enforced laws prohibiting the throwing of litter from automobiles; provision by State, county and municipal highway departments of suitable containers, appropriately placed; imprinting by manufacturers of canned, bottled and paper-packaged merchandise of a message against litter on the containers. The A.A.A. complimented industry for its support of Keep America Beautiful, which is aimed at the litter problem.

A New Tent

Outdoor people, including automobile travelers, may be interested to investigate the new OZARK tent manufactured by Porta Company, Inc., 32 Neponset Street, Canton, Massachusetts. This tent uses only nine pegs and no ropes, and even so has been used on Mt. McKinley in Alaska and withstood gales of sixty miles per hour. The tent weighs only a bit more than ten pounds, and the poles a little more than four pounds. It will sleep four people on the ground, or two with cots.

Secretary-General

Mr. Tracy Philipps, an eminent British scholar, economist and naturalist, has been provisionally appointed Secretary-General of the International Union for the Protection of Nature, which has its headquarters at 31 rue Vautier, Brussels, Belgium. He takes the place left vacant when Jean-Paul Harroy was named Governor-General of the Ruanda Urundi, Belgian Congo. The Union will hold its Fifth General Assembly in Edinburgh, Scotland, June 20 to 28, 1956. United States representatives on the Executive Board of I.U.P.N. are Dr. Ira N. Gabrielson, President of the Wildlife Management Institute, and Richard W. Westwood, President of the American Nature Association.

Open June 5th. Advance reservations necessary

hope for loving hermits

(semi-gregarious species)

peace-loving, quiet-loving, beauty-loving, sea-loving, nature-loving guests welcome . . . ten miles at sea, the stars your streetlights, the wide horizon beyond all desire.

the island inn monhegan maine

We'd like to send you our pictorial booklet H

NATURE STUDY

Spend your summer vacation at beautiful Elk Lake in the heart of the Adirondacks. Learn about the native plants, birds and other wildlife under the leadership of an experienced naturalist and teacher.

Excellent hiking trails, swimming, fishing and canoeing. Main camp and cottages with hotel service.

Two-week sessions, beginning June 30th and continuing through August, dependent on reservations. Special group rates. For detailed information address

Frank R. Schetty, 237 La Salle Ave., Hasbrouck Heights, N. J. or Mr. & Mrs. P. W. Sanders, Elk Lake Camps, Blue Ridge, N. Y.

PUTNEY SUMMER WORK CAMP

For high school boys and girls. Nondenominational, interracial. 950-acre farm. Painting, construction, farm work. Orchestra, chorus, drama, art, science, crafts. Hiking, canoeing, biking, horseback trips. Athletics, swimming. Outstanding counselor staff.

Camp Secretary, Putney School (N) Putney, Vermont

Free Book on Arthritis And Rheumatism

HOW TO AVOID CRIPPLING DEFORMITIES

An amazing newly enlarged 44-page book entitled "Rheumatism" will be sent free to anyone who will write for it.

It reveals why drugs and medicines give only temporary relief and fail to remove the causes of the trouble; explains a specialized non-surgical non-medical treatment which has proven successful for the past 37 years.

You incur no obligation in sending for this instructive book. It may be the means of saving you years of untold misery. Write today to The Ball clinic, Dept. 543, Excelsior Springs, Missouri.

In this picture the film was 4x5 Royal Pan, the time was 1/50, and the lens stop was f7.

Compare this bear picture with the one at the left and notice the depth of field obtained with a slower exposure. Here the film was 35 Panatomic-X, the time was 1/5 second, and the lens stop was f8.

THE Nature CAMERA

By EDNA HOFFMAN EVANS

Table Top Photography

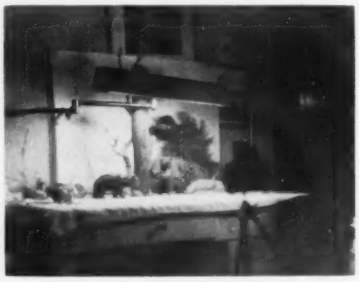
THE TERM COVERS A WIDE RANGE of purposes and subject matter. It need not be confined to a table top, nor do all of its subjects have to be inanimate or artificial. It may be done just for fun, or it can play a serious role in advertising, or as a definite form of illustration.

One glossary of photographic terms defines table top photography as "photographs using a variety of small models in a miniature setting." Another book on *Table Top Photography*, by Norris Harkness and Ernest Draper, describes it thus: "A loose definition would include the making of pictures of almost any small subject. But a more rigid definition. . . would include as table top only those pictures which definitely tell a story or express an idea, or those which reproduce a miniature setup as though it might have been a real subject. Table top photography does not preclude the picturing of anything, but it usually emphasizes the creation of the illusion of reality in the subject matter involved."

Table top photography is, to me, an escape from reality, but not in the sense that I am fleeing from reality. Instead, by means of the table top technique, I am able to free myself in large extent from the bonds of reality; from limitations imposed by time, space, practicality, and finances. On a table top I and my cameras can roam wherever we wish in time and space; we are confined only by the limits of my imagination and my ability to gather or create the materials required by specific settings.

Limitations, too

There are limitations, of course. I first planned this section on table tops as a follow-up to the January discussion of snow scenes. I was going to show how a resident of tropic climes could create his own snow scenes, even on the warmest day of the year. But, somehow or other, when I set about to build a snow scene I could not find some of the right materials. Snow was easy. Cotton, white cloth, salt, or the artificial stuff left over from Christmas decorations would serve very well. Icicles were relatively simple, too. But, being a Nature photographer, I wanted an animal in my picture, and none that fitted exactly into a snow scene was to be found in my miniature menagerie. My bears (wooden) would be hibernating; my horses (ceramic) would avoid snow in roaming free over the plains. Deer, so reminiscent of Santa Claus and Christmas, did not appeal as straight wintertime subjects. What I wanted was a mountain goat or a bighorn sheep, but I owned no such animal and a tour of the shops specializing in animal figurines failed to produce any such specimens. So I decided to file away the snow scene idea for future use and to concentrate on what I already had in the way of table top subjects.



The table top stage. Note 35mm camera and photoflood reflector in place for picture taking.

Some table top photographers make elaborate preparations for their pictures. They actually build a more or less substantial scene and a special stage. This is good technique when the photographer has definite specifications to meet, when, for example, his picture is to be used as an illustration or in an advertising campaign.

Since my table tops are usually an outgrowth of my own ideas, the settings usually grow, too, just like Topsy. Not being confined to a metropolitan skyscraper studio, I can scavenge the yard and the neighborhood for materials as I need them. Also, over the years, I have accumulated some semi-permanent "props" like rocks for the background, some

arty-looking twigs, and a table top sized "tree trunk" that originally came into my woodbox as a small log intended for the fire. When necessary, I can clip a few branches from the evergreens growing beside the door, or pick "bushes" and other properties from plants in the yard.

I built the scenes described herein on the top of my desk, with the wood surface covered by a light blue bath towel. To the wall behind I taped a piece of white wrapping paper on which I roughly sketched with a black marking pencil a "cliff" background. My fluorescent desk lamp was swung out to give an even light from above—the lamp is just 13 inches above the desk, but my scene was not quite that high. A photoflood bulb and reflector gave more light from the right and, since my subjects were quite motionless, I was able to use a shutter speed as slow as 1/5 second in order to stop my lens down to f:8. I used Kodak Panatomic-X film.

Check the scene

Since one cannot always judge just how the scene will appear to the eye of the camera, it is well to check the groundglass or viewer from time to time as the scene takes form. By this means slight adjustments can be made to give a more realistic appearance to the scene. Then, after all scenery and actors are in place, it is well to check again carefully. Do any of the bushes or tree branches seem to be sprouting from the actors' bodies? Is a light subject arranged against a darker portion of the background for the best visibility? Is the proportion right so that, for example, a "tree" looks like an ordinary-sized tree and not like a giant redwood in contrast to the rest of the scene? In miniature settings small details are of great importance.

In a way, the table top photographer is a lot like the puppeteer. He creates a scene in miniature that looks so real that the viewer is surprised when he returns abruptly to reality. I remember the first puppet show I ever saw, a production of "Sinbad the Sailor." So completely did my mind accept the foot-high puppets as real people that the human puppeteer looked like a giant when the curtain was drawn and he towered over the stage to receive applause at the end of the show. My illusion of size was shattered so dramatically that I felt dizzy for an hour or so thereafter. I have the same feeling when I stand off and view my table top stage in contrast to normal sized things.

Regardless of the fact that I could not locate the mountain goat or bighorn sheep that I wanted, there are a great many very life-like looking animal figurines to be found. Some of them, to be sure, are rather expensive but, fortunately, this is not always the case. They can often be found on toy counters as well as in ceramic stores and gift shops. These days they are made of plastic or ceramic materials. Gone, apparently, are the celluloid animals that I loved and played with as a child.

Ceramic figures

The plastic figures are usually not as fine in detail, and as a rule they are all one color. Unless the photographer uses them as silhouettes, or has the skill and patience to tint them properly, they do not serve as photographic models as well as do the ceramic figures.

Ceramics, in their turn, have some definite limitations. The high glaze usually used on them reflects many highlights, and in this way tends to minimize the atmosphere of reality that otherwise surrounds them. Lately, though, a few of the ceramic animals have been made with dull surfaces. These make much better photographic subjects than do the highly glazed ones.

For my part, I think wood carvings make the best table top models. They do not shine as do the china animals, and for this reason my Swiss bears are the favorite photographic subjects in my miniature menagerie. The chief trouble is that good wood carvings are usually even more expensive than the china ones.

Just as one can build the background from a variety of miscellaneous objects, so, too, can actors be constructed. Pipe cleaners seem to be the most popular media for this. However, papier-maché, balsa wood, modeling clay, or any number of other materials may also be used.

Thus, for variety of subjects, for additional interest, and for sheer challenge to the imagination, tabletop techniques offer great opportunities to the photographer.

FROM THE MAIL BAG. The month or two following the Christmas holiday season is a rather slow period so far as photographic developments are concerned. The camera, film, and photo supply houses seem to take a

TRUE TO-LIFE STORIES

BY DR. R. W. ESCHMEYER

A significant series of Children's Books important to the future of America's wildlife

Each book is a masterpiece of storytelling by one of America's leading conservation experts. Designed for the 8- to 14-year-old group, they are also thoroughly enjoyed by pre-school children and are entertaining and instructive for adults. Accurately illustrated in two colors.

Gifts that are . . . .

- **enjoyable**
- **long-lasting**
- **educational**

Paper-bound—50c; Cloth—$1.00

TITLES AVAILABLE: Billy Bass, Tommy Trout, Freddy Fox Squirrel, Bobby Bluegill, Charley Cottontail, Bob White, Willie Whitetail, Mac Mallard, Woody Woodcock, and Al Alligator.

AMERICAN NATURE ASSOCIATION
1214 16TH STREET, N. W.
WASHINGTON 6, D. C.

Please send me the following copies of Dr. R. W. Eschmeyer's TRUE-TO-LIFE STORIES.

Paper	Cloth	
.....	.....	copies of BILLY BASS
.....	.....	copies of TOMMY TROUT
.....	.....	copies of BOBBY BLUEGILL
.....	.....	copies of FREDDY FOX SQUIRREL
.....	.....	copies of CHARLEY COTTONTAIL
.....	.....	copies of BOB WHITE
.....	.....	copies of WILLIE WHITETAIL
.....	.....	copies of MAC MALLARD
.....	.....	copies of WOODY WOODCOCK
.....	.....	copies of AL ALLIGATOR

50c each, Paper-Backed; $1.00 each, Clothbound

..... sets (10 books) Cloth, at $10.00 $.....
..... sets (10 books) Paper, at $ 5.00 $.....
( ) I Enclose Payment. ( ) Please Bill Me.

NAME .....
ADDRESS .....
CITY ..... STATE .....

much-needed rest after going all-out for the holiday trade. Thus, mail bag offerings are not too great at the moment. However, the following are the most interesting:

New publications, or new editions of older data books, released by Eastman are the sixth edition of *Kodak Papers*, a new edition of *Infrared and Ultraviolet Photography*, and a completely new data book *Ektachrome Film*. In the new edition of *Kodak Papers* the section dealing with the physical and photographic characteristics of Kodak papers has been brought up to date and the remainder of the 64-page book has been rewritten. It sells for 50 cents. The *Infrared* data book also contains new material, having been expanded to 48 pages in order to include sections on infrared motion picture photography and the use of the newer forms of ultraviolet light sources. The price here is also 50 cents.

The new book on Ektachrome film, of course, deals with Eastman's new roll color film. It contains useful, easy to understand information for color enthusiasts at all levels of the photographic ladder. For beginners, there is a glossary of basic photo terms, a brief discussion of exposure on sunny and cloudy days, and an explanation of the use of flash. For more advanced camera users there are tips on close-up picture taking, as well as an introduction to bounce flash in color—a method of getting the kind of quality with one flash lamp that would ordinarily necessitate the use of three or four flash bulbs. There is also a discussion of techniques for developing color film in the home darkroom. This booklet sells for 35 cents.

For the movie enthusiast, the Kalart Company has a new how-to-do-it booklet *Editing for Better Movies* by Leo J. Heffernan. The author, an award-winning amateur movie maker, offers easy-to-follow suggestions on how to take the rough footage returned by the processor and prepare it for home showing. The illustrated 36-page book gives a step by step discussion of such topics as scene construction, sequencing, humor, and other aspects of movie editing. The Kalart Company, Plainville, Conn., manufactures home movie editing equipment and the book may be obtained directly from the company for 50 cents.

On a smaller scale, but equally important so far as information is concerned, is the new 10-page booklet *Ansco Prepared Chemicals* recently made available by Ansco, Binghamton, N. Y. Available free from the company and from all Ansco dealers, the booklet provides a compact ready reference to Ansco's line of prepared developers, fixers, toners, reducers, and other special aids for darkroom work.

These booklets are excellent sources of information and reference for anyone interested in the special phases of photography that they cover.

Nutmeg

(*Continued from page 134*)

with peper, saffron, with vergis, cloves & mace. Stew & shake it up thicke. Garnish with barberries."

Or these "Chervettes of Beef" as described in *The Good Huswives Handmaid:*

"Take a little veale and slice it and parboil it, then take it up and presse it in a faire cloth & mince it very fine, take corans and dates & cut them very small, take some suet & the yolkes of three or foure egges and pepper, salt & nutmeg, and the crums of bread finely grated, then mingle all these together, & put in suet enough and so put them in coffins and they will be good pies."

Comets

(*continued from page 157*)

may well turn out to be the most interesting. Comet Crommelin was last observed in 1928. It is expected at perihelion in October, 1956, by which time it should be brighter than the seventh magnitude.

In the month of March the New Moon will occur on March 12, and the moon will be full on March 26.

Spring will begin on March 20 at 10:21 A.M., Eastern Standard Time.

Mercury will rise about half an hour before the sun on March 15. It will be found in Aquarius, just above the southeastern horizon, but its proximity to the sun will make observations difficult.

Venus, in Aries, will be approximately forty degrees above the horizon at sunset, and will set about three and a half hours after the sun. Excepting the Moon, it will be the brightest object in the sky. The Moon and Venus will be in conjunction on March 16.

Mars, in Sagittarius, will rise about four hours before the sun and may be seen low in the southern sky at sunrise. The Moon and Mars will be in conjunction on March 6.

Jupiter, in Leo, will be west of Regulus on March 15. On that date, it will be up in the east at sunset, passing overhead in late evening and setting about an hour before the sun.

Saturn, in Libra, will be approximately ten degrees north of Antares. It will rise just before midnight on March 15, and will be low in the southern sky at dawn. The Moon and Saturn will be in conjunction on March 3, and again on March 30.

Rosies

(*Continued from page 155*)

her downfall. That and her curiosity. One night when my bed had been turned down for sleeping, she came sailing on her lacy wings toward a mound of covers, and ducked underneath to see what she could see.

It was dark inside there and instead of coming out the way she went in, she tried to push her way down to the foot of the bed. Before I could reach her, she went too far. The comforter proved to be too heavy. She was crushed. III was the last of the Rosies. Never again on twig or flower, screen or windshield have I seen another of these dainty, almost fairy-like, little creatures.

Allen Honored

Dr. Durward L. Allen, Associate Professor of Wildlife Management at Purdue University and author of *Our Wildlife Legacy*, has been awarded the Medal of Honor of The Anglers' Club of New York. The medal is awarded to recognize, honor and encourage outstanding service in the fields of conservation, ichthyology and the sport of angling.

Against Oil

Word comes from the International Union for the Protection of Nature that Germany has ratified the international agreement aimed at curbing major damage done to waterfowl, sea life and coastal areas by oil pollution of the seas. Great Britain has already signed the agreement, which was drafted when forty-two nations met in London in 1954 for the International Conference on Oil Pollution of the Seas.

THE Nature MARKET

AGENTS, SALESMEN WANTED

BUY WHOLESALE, 25,000 items. Catalog 25c. Matthews 1474-Y-6, Broadway, New York City 36.

BINOCULARS and GLASSES

BINOCULARS, Microscopes, Telescopes, amazing prices, free trial. Folder "Binocular Selecting" catalog free. Prentiss Importers, Mercury Bldg., West Los Angeles 25, Calif.

BINOCULARS, TELESCOPES. From 3 continents. All types, prices, new and used. Postpaid by Museum Curator, an experienced professional user. Liberal trades. Bartlett Hendricks, Binocular Headquarters, Pittsfield 50-N, Mass.

BINOCULAR SPECIALISTS, all makes repaired. Authorized Bausch & Lomb, Zeiss-Hensoldt, and Bushnell dealer. Tele-Optics, 5514 Lawrence, Chicago 30, Illinois.

BIOLOGICAL SUPPLIES

NATURALISTS CATALOG PLUS Geiger Counter, Scintillator and Mineralight Lists 25c. Chameleon 85c. Albino or Golden Hamsters $4.75 trio. 200 Mealworms $1.25. Ant Home $3.50. Ant Colony $3.95. Handy Snake Handling Stock $2.75. Baby Black Alligator $4.65. Quivira Specialties, Topeka 20, Kansas.

BIRDS

BIRD WATCHING TOUR in Mexico, with experienced tropical naturalist, Audubon Screen Tour lecturer. Ernest Edwards, Amherst, Virginia.

BOOKS

POWERFUL MENTAL TELEPATHY. Unlimited Free Literature. Joseph Johnson, Globe Road, Lewisburg, Tenn.

BOOKS ON BIRDS, Mammals, Reptiles, Trees, general nature subjects. Catalog sent on request. Pierce's, Winthrop, Iowa.

SECURE YOUR out-of-print books from the Audubon Book Service, 415 Lincoln Ave., Dept. N, Brooklyn 8, N. Y.

BOOKS. Hard-to-find and out-of-print our specialty. All subjects. Send Wants! Jaher Book Service, 183 Hazelwood Drive, Westbury, New York.

NATIONAL GEOGRAPHIC MAGAZINES 1888-1954. Any issue. Periodical Service, Box 465-N, Wilmington, Delaware.

BUSINESS OPPORTUNITIES

GROW EXPENSIVE HERBS FOR US! Big profits home-business of your own. Year around profitunity! We supply everything necessary! Send for FREE RARE SEEDS AND REVEALING PLAN. National Herb Exchange, Dept. N, Gardena, Calif.

BUTTERFLIES

LIVING COCOONS: The nation's largest selection of living cocoons for sale; also a complete line of living insects. Listings of tropical butterflies and beetles available. Free list sent on request. M. W. Osborne, 2100 Price St., Rahway, N. J.

BUTTERFLIES: 20 Named United States including Giant Moths, Zebra, $2.00. 20 Different Amazon including Swallowtails, Gorgeous Urania, $2.00. 20 World Tropicals including Emerald Swallowtail, Huge Bird-Wing, $2.00. M. Spelman, 2277 Andrews Ave., New York 68, N. Y.

EVERGREENS

RHODODENDRON MAXIMUM, Mountain Laurel, Hemlock, Holly and Flame Azalea. 2-4 ft., 10, $3.00; 25, $6.00; 100, $20.00. Write for carloads and truckloads prices. J. F. Norris, Doeville, Tenn.

HOBBIES

SEASHELLS, Nature's Treasures of the Sea, appeal to Hobbyists. Lists of $1.00 to $5.00 Specials on request; 5 Odd Marine specimens $1.00; write for free lists today. Mrs. F. K. Hadley, 48 Adella Ave., West Newton, Mass.

FOLKLORISTS, AMUSING PERSONAL letters, authentic mountain folklore, anecdotes, weekly or monthly, fifty cents each, from mountaineer Lost Creek log cabin philosopher, Berniece Hiser, Buckhorn, Kentucky.

HOME STUDY

PAINT OILS: Exciting Home-Course. $1.00 brings trial lesson. Prickett's Windforest Studios, Bar Harbor, Maine.

INDIAN CURIOS—RELICS

ARROWS: Thirty, assorted colors $5.00. Five Spearheads $5.00. Book-Relic Catalog 50c. Tilton Relics, Topeka 20, Kansas.

5 EXTRA FINE Ancient Indian War Arrowheads $2.00. Pipe $4.00. Thunderbird $2.00. Spearhead $1.00. Drill $1.00. List Free. Arrowhead, Box 1249, Hot Springs, Arkansas.

LEATHERCRAFT

FREE "Do-It-Yourself" Leathercraft Catalog. Tandy Leather Company, Box 791-N15, Fort Worth, Texas.

MINERALS

40 LARGE COLORFUL MINERAL specimens, identified, educational, $4.00 postpaid. Also Collector items. B. D. Blackwell, 554 Lake St., Reno, Nevada.

MINERAL COLLECTIONS. Eighteen unusual specimens including uranium and gold ore. Attractively mounted, identified, and described. $1.00 postpaid. Ryzelite Minerals, Box 455, Golden, Colorado.

15 POUNDS Colorado, Wyoming Agates and Woods for cutting and polishing—$10.00 postpaid. Ex Mineral Products, Box 36-NM, Westminster, Colo.

MISCELLANEOUS

SAVE, BUY FROM Government. Hundreds of items. Trucks, jeeps, boats, motors, machinery, tools, typewriters, binoculars, hunting, fishing, camping, sporting equipment, radio, photographic equipment, etc. Government Surplus Bulletin $1.00. Box 169FE, East Hartford 8, Conn.

BIRDS and ANIMALS carved and painted on order, natural color, very lifelike. For price details write Clem Wilding, Berger, Missouri.

NATURE LAND SURVEY

SURPRISE YOUR FRIENDS with your knowledge of the birds, trees, flowers, ferns on your property. A Nature Survey will reveal a surprising wealth of wildlife on your estate. Our experienced naturalist will identify species, write report and suggest Nature Trail. Very reasonable. Caribou Press, Wildlife Publishers, Box 236, Bronxville, N. Y.

PAINTINGS

FREE—INTERESTING BROCHURE—"Ensuring Your Remembrances". Enjoy colorful portraits. Write: Darstudio, Ojai, Calif.

MESQUAKIE INDIAN "Pipe Dancer" and "Buffalo Dancer" pictures, from original drawings by Push e to ne qua, Mesquakie Indian Artist. Paint them yourself in ten gorgeous colors with the Tamacraft Kit No. 4. Simple to do, but beautifully designed. Kit includes one Pipe Dancer and one Buffalo Dancer picture, in authentic and colorful traditional ceremonial dress; two detailed instruction chart-pictures; two 11"x14" cedar-grain-tan finish mats for framing; one painting brush; ten brilliant genuine casein colors. Finished paintings fine for den, office, or parlor—or as a truly personal gift. Complete Kit $2.00, postpaid. Tama Indian Crafts, Field Station, Tama, Iowa. (Dealer inquiries invited).

SEA SHELLS

TREASURE SHELLS of Florida and Caribbean Coasts. Exquisitely fashioned by mother nature, these shells are among the most beautiful in the world. Start your own collection. Nine choice specimens especially selected and bosed with descriptive folder are yours for $2.00 postpaid. Money refunded if not delighted. SHELL TREASURES, 2116 Palm Terrace, Sarasota, Florida.

OREGON MARINE FOSSILS, named specimens. 6 postpaid $1.00. Addie Partridge, 135 S.E. 52nd Ave., Portland 15, Oregon.

BUTTERFLY MOUNTING KIT

This hobby kit consists of: 10 Tropical Butterflies, one 4" by 12" spreading board, 50 insect pins, 50 glass-headed pins, 2 glass strips used in mounting, one pair of forceps, relaxing jar for softening dried butterflies, one Riker display mount, paper strips for pinning down wings, and a free 20 page booklet giving full instructions in picture form on how to mount Butterflies as well as a world of other material and stories about butterflies and butterfly collecting and mounting. All the material you need to start a Butterfly Collection.

ALL THIS FOR ONLY $3.95 postpaid

BUTTERFLY NYLON NET—24" handles only $2.00 each.

BUTTERFLY SETS, from Formosa, Brazil and Mexico. only $1.00 per set.

Each set is different and contains 10 perfect, named, and in papers, unmounted butterflies. This is a wonderful opportunity to get a beautiful collection of tropical butterflies at a very nominal price.

Special Discount to Nature Camps and for Resale Entomological Supplies — Riker Mounts, Insect Pins, etc.

Free Price List

BUTTERFLY ART JEWELRY INC.

295 E. 98 Street, Dept. N, Brooklyn 12, New York

Wilson

(*continued from page 136*)

any hawk picture. He gets some action into the illustration (Pl. XVIII) of a female Maryland yellowthroat feeding a young cowbird. In Volume III, the firmness of the drawing improves, and in Volume IV appears the first full, although rather sketchy, landscape, with the representation of a bald eagle, which in itself is very good. In Volume V, improvement continues and his plate of swallows (XXXVIII) is as good as anyone's pictures of such birds. The work on a pair of nighthawks (Pl. XLV) is excellent. Parenthetically it may be remarked that Wilson was the first accurately to identify and describe the three species of the nighthawks' family that are common in the eastern United States.

There is a finely detailed drawing of the sharp-shinned hawk in Volume V and of the broadwing in Volume VI. It seems almost an axiom that ornithological artists of every generation have done best with hawks, perhaps for one reason because the abounding detail in their plumages demands close attention and careful workmanship. Beginning with Volume VII, the birds treated average larger, so are portrayed on a more reduced scale; they are more crowded on the plates; and are less diversified in pose. There is some retrogression from the standard brought forward with the successive volumes on the land birds, although some individual portraits are very good; the very last, of the great-footed, or duck, hawk, is excellent. A point of interest in connection with the illustrations is that the first two plates in the work were etched as well as drawn by Wilson; and worth remembering also is that much of the coloring was done by him, at times to earn subsidies demanded by the printer.

As to the text, he says that as much as possible of the descriptions were written in the woods, leaving as little as might be to recollection. Each species account begins with English and scientific names and continues as data permit with citations to the works of Catesby, Latham, Bartram, and other authors. He then presents personal gleanings as to habits, natural history, and folklore, and ends with quoted material. That is the full schedule; often the treatment is shorter due to scarcity of information. Occasionally original verse is inserted, as for the Baltimore oriole, bluebird, hummingbird, phoebe, fish hawk, and bald eagle. Early in the field, he saw and recorded many things that ornithologists have been "rediscovering" ever since. His account of the yellow-breasted chat seems particularly illustrative; he notes its flight song and other vocalization that may be continued through the whole night, and very well describes what we now call occupation and defense of territory, and deems the song of the male as inviting passing females to his retreat.

Wilson's style is lively and attractive, even some of the descriptions of plumages making good reading. In his earliest ornithological studies, the present writer was fortunate enough to have access to a "set of Wilson," which instructed, entertained, and inspired, confirming him in his desire to continue in a science so amiable and rewarding.

Certain technical phases of the text are worthy of comment. In the preface to Volume II are directions for preparing a bird skin; and in that for Volume IV is a breeding bird census of 51 species nesting in the eight acres of Bartram's Garden during the summer of 1811. The sequence of species in the work is not systematic but is one of convenience as the birds came to hand. Yet lists after the system of John Latham are presented; of the land birds by Wilson in Volume VI: 185 species, 45 of which supposedly had not previously been figured or described; and of the water birds by Ord in Volume IX, corresponding statistics—94 and 10. Of course some of the 55 apparently undescribed birds later proved to have been described by other authors, but even so the Check-List of the American Ornithologists' Union credits 31 species to Wilson. All of his descriptions but two have been identified, namely, those of the Blue Mountain warbler and the small-headed flycatcher.

George Ord saw the last two volumes through the press and his relation to them and to Wilson should be clearly understood. He was a Philadelphian of independent means who had accompanied Wilson on some of his field work and who in a true sense was his friend. His "Biographical Sketch" occupies 36 of the introductory pages in the final volume (IX, 1814) of the *Ornithology*. All of the plates in the entire work, including the two posthumous volumes, were painted by Wilson and all but one were engraved under his supervision. The coloring had not kept pace, however, and a new colorist was engaged and completed the work under Ord's direction. The text of Volume VIII had been printed while the author was alive, but Ord wrote some of the descriptive matter for Volume IX. Ord was not, nor did he pretend to be, joint author of the work, nor did he *continue* it. The simple truth is that the last two volumes were issued under his editorship.

The single new species in Volume IX is by Ord and he named it Wilson's plover, *Charadrius wilsonia*. That was the first of such honors to Alexander Wilson, but there have been many since, totalling fifty or more specific dedications, mostly of birds, but including two of mollusks. There is also a genus of birds, *Wilsonia*, embracing three attractive species of wood warblers. Wilson was elected Member of the American Philosophical Society a few months before his death, and had previously received similar recognition from the Columbian Society of Artists and the Academy of Natural Sciences of Philadelphia. There have been several biographies and memoirs, one of them of two volumes having been published in his native town of Paisley, Scotland, where a statue of him has been erected. The Wilson Ornithological Club organized in 1888 and its magazine, *The Wilson Bulletin*, also commemorate him.

Elliott Coues summed up Wilson's work by saying that "Science would lose little, but on the contrary would gain much, if every scrap of pre-Wilsonian writing about United States birds could be annihilated"; and commented, "Perhaps no other work on ornithology of equal extent is equally free from error; and its truthfulness is illumined by a spark of the 'divine fire'. This means immortality." To my mind the greatest lesson to be learned from Wilson's career is that success comes to a man when he finds the work he loves. Alexander Wilson made that find and lived his life in its last ten years.

Answers to Quiz

1. lime; 2. gold; 3. moon; 4. Rhine; 5. soap; 6. whet; 7. blood 8. cobble; 9. brim; 10. cap; 11. flag; 12. gall; 13. Jack; 14. sand; 15. hearth; 16. load; 17. mile; 18. beetle.

Travels and Traditions of Waterfowl
By H. Albert Hochbaum. Minneapolis. 1955. University of Minnesota Press. 301 pages. Illustrated by the author. $5.00.

One of the most fascinating wildlife subjects involves the migratory habits of our wild ducks, geese and swans and the behavior pattern of these waterfowl. And there is perhaps no better place to observe these phenomena than the Delta Waterfowl Research Station at Delta, Manitoba, Canada. This Station is sponsored by the North American Wildlife Foundation and the Wildlife Management Institute, and Al Hochbaum is its director. For seventeen years he has studied and recorded data about the waterfowl in residence and in passage, carried on a variety of fascinating experiments and delved deeply into the literature. In this splendid book Mr. Hochbaum gives us a detailed explanation and analysis of the theory of biological tradition and the role that tradition plays in the migrations of waterfowl. His chapter on the awareness of waterfowl with respect to time and space is one of the most intriguing and engrossing on this book. One need not even have an interest in birds to find this volume fascinating, and the bird enthusiast will revel in it.

Louis Agassiz Fuertes
By Mary Fuertes Boynton. New York. 1956. Oxford University Press. 317 pages. Illustrated. $7.50.

"In the history of ornithology in North America, a few names stand out as the architects and builders of a science that has achieved great popular appeal," writes Arthur A. Allen, himself one of those architects and builders, in a foreword to this important book. "The name of Louis Agassiz Fuertes stands out among these as the greatest artist of wild bird portraits that has ever lived."

His greatness as a bird artist cannot be challenged, but Louis Fuertes had many other qualities of greatness that endeared him to all who knew him, and made his untimely passing a tragedy beyond words. His daughter has performed a signal service in presenting in this book the life of her distinguished father. She has done so through an interesting and effective biographical technique that supplements her own story of his life and progress by using the artist's correspondence to interline her own writing. Thus Louis Agassiz Fuertes "comes alive" in what is, in a sense, a biography-autobiography, and in a book that is certain to be welcomed by all lovers of birds.

Celebrated American Caves
Edited by Charles E. Mohr and Howard N. Sloane. New Brunswick, N. J. 1955. Rutgers University Press. 339 pages. Illustrated. $5.00.

Fifteen "spelunkers" collaborated to make possible this book, which is edited by two distinguished cavegoers and sponsored by The National Speleological Society. Seventy years ago a book by the same title, written by Horace C. Hovey, was published. Since that time much more has been learned about our caves, and speleologists have increased in number and knowledge. The caves selected for discussion and description in this book are the most important ones, some that have been long known and others that deserve to be better known. The several chapters are uniformly well written and interesting and exciting reading. They effectively introduce the reader to the fascinating world under ground.

The Diabetic's Cookbook
By Clarice B. Strachan. Austin 12, Texas. 1956. University of Texas Press. 304 pages. $6.50.

With attention to diet and, if necessary, with insulin, the diabetic can live a perfectly normal life and, more often than not, be better off than many of us whose dietary habits leave much to be desired. The son of the author of this valuable book is a diabetic, and over a period of fourteen years of cooking for him Mrs. Strachan developed and proved the recipes—more than 200 of them—gathered between covers. The book is brought out under the auspices of the Medical Arts Publishing Foundation of Houston, Texas. It is endorsed in an introduction by Dr. Charles H. Best of the Charles H. Best Institute of Toronto, Canada.

Rocks and Minerals of California
By Vinson Brown and David Allan. San Martin, California. 1955. Naturegraph Company. 120 pages. Illustrated. $2.75.

This is a book of special interest to the "rockhound" pursuing his hounding in California. A series of locality maps show the areas in which certain rocks and minerals may be found. A series of full color plates show 32 minerals and 16 rocks.

THE Nature MARKET

SILK WORM EGGS

100 Silk worm eggs, enough to provide classroom demonstration of metamorphosis or silk farming. $1.00, postpaid. Tom and Marc Carmichael, 114 East Calvert Street, South Bend 14, Indiana.

STAMP COLLECTING

50,000 STAMP GRAB BAGS, 25c each. Anderson, P.O. Box 1, Reading 11, Penna.

BEAUTIFUL BIRDS, INSECTS, ANIMALS and flowers of the world on stamps. 25c brings samples, list and 25c credit slip. Lewis, 1338 Buena Vista, Palm Springs, California.

115 STAMPS FROM ALL 5 continents including Airmails, Dead Countries, Pictorials, etc., value over $2.00, all for 10c to introduce our superb service of U.S. and Foreign Approvals to collectors. Globus Stamp Co., New York 10, N. Y. Dept. 84.

AMERICAN ANIMALS free! Bargain catalogue. Hammond, D781F, Crystal Beach, Florida.

TELESCOPES

SKYSCOPE, the full 3½-inch reflector, price — $29.75. Sixty power, ¼ wave aluminized mirror, equatorially mounted, ready for use. Guaranteed observatory clearness. Used by schools, universities. Straightforward descriptive literature on request. The Skyscope Company, Inc., 475N Fifth Avenue, New York 17, N. Y.

WOOD COLLECTIONS

Wood Collections. Eighteen wood samples mounted and identified. Samples have been cut to show the heartwood. Booklet describing uses and locations included. $1.00 postpaid. Ryzelite Products, Box 455, Golden, Colorado.

Learn To MOUNT BIRDS

TAN SKINS, MAKE UP FURS
Be a Taxidermist. We teach you at Home. Mount Birds, Animals, Pets, common specimens. Save your hunting trophies, decorate home and den. Make genuine KROME LEATHER, tan and make up furs for sparetime profit. INVESTIGATE TODAY
FREE BOOK 48 pages-tells all about it. Hunters, get your copy. It's Now Free. Send post card. State your AGE.
N. W. School of Taxidermy, Dept. 8103, Omaha, Nebr

NATURE MAGAZINE BINDER

Every number of Nature Magazine is worth reading again and again. For your convenience and pleasure, we have secured this beautiful and substantial binder.

Grasp this opportunity for greater enjoyment from your magazines — bind them in our special two-tone, hand-colored cover, embossed in gold, and they will be preserved to give you a lifetime of enjoyment.

Many requests make it possible for us to offer you these artistic, leather-like covers, which have been especially created for our members, in which you can insert each issue, as you receive it, in a half minute, without any punching or other annoyance to try your patience.

Each binder will hold twelve issues and is guaranteed. Your money refunded if you are not more than pleased. $3.00 each

Your Name or Year stamped in Gold for 80c extra. Both name and year for $1.20.

AMERICAN NATURE ASSOCIATION
1214 Sixteenth St., N. W., Washington 6, D. C.

Nature AND THE MICROSCOPE

By JULIAN D. CORRINGTON

The Museum Builder

IN DAYS OF CALLOW YOUTH, when we were grinding it out for a doctorate and serving as assistant in charge of the museum of the Department of Zoology at Cornell University, we were assigned the saturnalian task of museum-wrecker. It transpired that the old museum had become fuddy-duddy and was seldom visited by even the most enterprising of undergraduates, and so it was decided to modernize. We were sent to New York to see what was going on in metropolitan collections, and proceeded to gather ideas at the American, the Brooklyn, and Children's Museums. Here we were introduced to the burlap background, the Shrosbree hanger, and the variable-font typewriter, all of which we speedily imported to Ithaca.

But what to do when back on home precincts? Here was a two-story loft in McGraw Hall—a main floor and circular gallery. Rising out of the center pit was an enormous iron and plaster reproduction of the skeleton of a *Megatherium*, giant extinct ground sloth, one of the more notable of Pleistocene mammals that wandered up from the south during a warm spell and invaded North American forests. Flanking this monster were two more, a cast of a *Glyptodon*, huge mace-tailed armadillo, and an equally big fossil turtle replica. These had been the stellar attractions in the old "dead circus" type of museum, but their day was past; they could play no part in habitat groups or functional exhibits; it was ruled that they must go. And so, armed with a sledge hammer, we commenced the mayhem.

Little did we realize it then, but we were demolishing three of the prime sales items of an earlier era at Ward's Natural Science Establishment, in nearby Rochester, and could we have foreseen that we were to join that same Establishment years hence as a department head, we should most certainly have turned our iconoclastic propensities into other channels. From time to time we were aided or egged on by the corps of graduate students of that college generation, among them being the future president of Ward's, but at the time an assistant in anatomy, Dean L. Gamble; Ludlow Griscom, now ornithologist extraordinary of the Museum of Comparative Zoology at Harvard; Karl Patterson Schmidt, at present the Emeritus Curator of Zoology at the Chicago Natural History Museum, one of the many great museums originally outfitted by Ward's; Eleanor McMullen, Chairman of Biology at Wells College; Leon Augustus Hausman, now retired, recently ornithologist, zoologist, and chairman at Rutgers; Albert R. Shadle, Emeritus Professor of Biology at Buffalo; and others. It is not of record that any member of this group had the grace to shed a tear for the poor old megatherium.

SCIENCE SHOPS 8

Ward's Natural Science Establishment

Museums of the past

Have you ever seen one of these former museums? There were row upon row of large glass cases down the center aisle of each corridor, containing the larger mounted beasts and birds and their skeletons, while along the sides were wall cases for the smaller exhibits. The whole animal kingdom would be represented, with everything either stuffed, dried, or pickled. Every university in the land had one, primarily for teaching rather than for public exhibition. Every big city took pride in its museum of natural history and there were state collections in many capitals. It is no exaggeration to say that the man primarily responsible for all of them was Henry A. Ward.

In the December, 1955, issue we have recounted some of the main events of his tumultuous career and noted that he was probably the greatest traveler who ever lived. Toward the latter half of his life he became internationally known as *The Museum Builder*, a title fully deserved.

As a youth, Henry Ward's chief ambition was to form his own cabinet of minerals, then with fossils added, and finally of all natural objects, and through the years these collections grew to mighty proportions. In 1860, when Ward took up his sporadic duties as Professor of Natural Sciences at the University of Rochester, at the unprecedented age of 26, he thought to sell his cabinets to the University, but found President Anderson unsympathetic and at times hostile to the proposition, the trustees unconvinced of the educational value of these materials. The day of widespread science teaching had not yet arrived, but even so the University of Rochester, at a time when a great university was only a gleam in the eye of Ezra Cornell, muffed the play completely and lost their golden opportunity. Ward began his uphill fight, finally effecting the sale for $20,000, a sum that included a considerable loss. This, the finest collection in America, although unappreciated by its home institution, which relegated it to an attic floor, drew many visitors from all parts of the country and from abroad. The first immediate result was an order to supply a complete cabinet of geological specimens to Vassar Female Seminary, soon to become Vassar College, for $8000. This was completed in 1864, but Ward lost $1000 on the deal! These two examples were, alas, too often typical; Henry Ward was no accountant and frequently sold items at too low a figure to cover their cost, let alone the realization of a profit.

For a new look

Now the Professor entertained the grand idea of outfitting the universities and colleges with complete museums, embracing botany, zoology, and geology, but found his own institution looked upon such schemes as commercial and undignified. Ward built Cosmos Hall on the University campus as his chief workshop, and because it soon overflowed, added Chronos Hall nearby. In a short time Cosmos Hall became the central building of a group and was famous locally for the pair of whale jaws that arched its gateway,

and as "Ward's Museum" where one could see great mounted mammals from the far corners of the earth—kangaroos, rhinos, lions, and the huge gorilla, whose display created so much excitement in these days following publication of Darwin's *Origin of Species* (1859). There were cases full of minerals, rocks, and fossils; and dominating all, the great molds and casts of famous discoveries in paleontology and archaeology. The gorilla wound up at Vassar, but for many years wore a pair of short pants, by order of the trustees!

Among these casts were reproductions of the bones of the giant ground sloth, *Megatherium cuvieri*, the plaster elements reinforced with a concealed iron framework, then painted a dark reddish-brown. The assembled skeleton was depicted as reared upright, its forelimbs in the act of tearing down a tree so the beast could browse upon the leaves. These were the largest of land mammals, excepting only the elephants, and the student of Victorian times was bound to be impressed by the huge size of the extinct creature and to think about the marvelous panorama of evolution so recently presented by Darwin. Hiram Sibley gave one of these restorations to Rochester and other colleges were to follow suit until finally no self-respecting university museum in the land would be caught without a megatherium. Now the full atrocity of the outrageous act of demolition that we performed on the Cornell casts, a half-century after their installation, may be appreciated! It was upon casts of this sort of a wide variety of extinct plants and animals that the rise of Ward's to a business firm of international scope was in part based.

In 1869 the first of a series of disastrous fires struck the Establishment. Cosmos and Chronos Halls burned, with a loss of about $50,000. Most of the molds for casting fossils, most of the great zoological collection, and a large quantity of mineral specimens were lost, but characteristically, the Professor recorded in his diary that he "raised a new building" just four days later. Then, four years later, the great panic of 1873 caught Ward's with many accounts they could not collect and so Uncle Levi A. Ward put Henry through bankruptcy and took charge of the business. The recovery was almost as rapid as the fall, however, and soon Ward's was booming along again, more especially after several of the larger windfalls that were now to come.

Chicago exhibits

To the Chicago Exposition of 1875 Ward took a large series of exhibits, and the major portion was thereafter sold, as he had hoped, to the Chicago Academy of Science. Then Lewis Brooks gave Ward $50,000 and later $25,000 more, to establish museums of natural science at Washington and Lee and the University of Virginia, the donor to remain anonymous. Needless to say the Professor had a field day with this huge order (remember the value of money in 1875!) but it was only the first of many. The next two years witnessed the great Centennial Exposition at Philadelphia, with Ward entering a small display that soon had to be expanded to a big one by popular request. He pronounced the Cardiff Giant to be a hoax. The Establishment was given the task of mounting both the skin and the skeleton of P. T. Barnum's great elephant Jumbo, which were thereafter exhibited by the circus. He brought the celebrated restoration of the Siberian mammoth to America, and he continued to make sensational trips around the world and into its farthest corners, ever on the hunt for specimens. His fame grew and spread among the non-scientific public until he was as well known as his crony, Buffalo Bill.

Instances of the sale of cabinets or of whole museums could be multiplied through many years; a catalog issued by Ward in 1890 listed eighty such installations. But the crowning achievement was the sending of a train of thirty freight cars full of specimens for the great Columbian Exposition at Chicago in 1893. This vast display included a mastodon skeleton, large numbers of mounted animals and their skeletons, an exhibit of human osteology, casts of fossils and of a spectacular collection of gold nuggets and replicas of famous gems, relief maps, and many rock and mineral specimens from all over the world. Just when it appeared that this extravagant entry would result in serious financial loss, the whole of it was purchased by Marshall Field for $100,000, and became the foundation of the celebrated Field Museum, now the Chicago Natural History Museum, one of the world's largest.

In many ways, however, the most important contribution of Henry Ward was not the providing of displays for museums, but the training of personnel. So many men who subsequently progressed to fame and to leading positions in America's scientific institutions received their early technical experience at the Establishment that they have frequently been designated Ward's "alumni." First may be listed Henry's eldest son, who assisted his father in many ways over the years, later to split away as a separate firm, Charles H. Ward, noted as America's finest preparator in human osteology. Here are a few thumbnail sketches of some of the more notable men who "graduated" from Ward's to higher positions:

Carl Akeley

Carl Ethan Akeley (1864-1926), famous American naturalist, explorer, inventor, writer, and animal sculptor, came to Ward's home in 1883 and presented a card stating that he was a taxidermist. Telling the youth he might have to unlearn all he knew, Ward gave him a trial, but the shoe was on the other foot, as young Akeley soon revolutionized current taxidermic modes. He introduced the method of preparing a carefully modeled cast of the skinned animal, over which the treated skin was then stretched, giving to the finished mount a completely lifelike appearance. No longer were animals to be "stuffed." His system was put to a severe test when he took on the colossal task of mounting the skin of Jumbo, who had stood twelve feet high. In 1887 Akeley went to the Milwaukee Museum and in 1895 to the Field Museum. His mature work was crowned by the great Hall of African Mammals at the American Museum in New York. He is the author of *In Brightest Africa*, 1923.

Grove Karl Gilbert (1843-1918), noted American geologist, was proud of the fact that he was the senior Ward "alumnus." Son of an artist of recognized merit, he helped Ward while enrolled as a student at the University of Rochester, and thus got his geology in double doses at all hours. In 1863, a year after graduation, Gilbert joined the Establishment and became Ward's right-hand man until after the first fire, in 1869, when he left to become a member of the United States Geological Survey. In 1879 he was made Geologist with the Survey, and continued as such for many years, taking a prominent part in the mapping of the West, authoring many publications.

William T. Hornaday (1854-1937) is widely known for his writings in natural history and conservation. In 1873, while the panic was on, Ward received a letter from a young man at Iowa State Agricultural College inquiring if it would be possible to learn taxidermy at the Establishment; he was told to come ahead and in this manner joined the staff. He became a taxidermist extraordinary, traveled with Ward to far places, and was sent on collecting trips of his own, notably to India and the Malay islands in 1876-7, from which he returned with an elaborate collection. One result was his publication, in 1885, of his best seller, *Two Years in the Jungle*, still popular today, and another was his mounting of one of the first habitat groups ever shown to the public, an orang-utan family. This was another great step forward in taxidermy. In 1883 Ward suffered one of his severest losses when Hornaday accepted the position of Chief Taxidermist of the United States National Museum in Washington. In 1896 he was appointed Director of the New York Zoological Park, remaining until his retirement in 1926. He was always a tremendous admirer of Professor Ward, and said "he was the most remarkable scientific genius I ever knew."

Edwin Howell

Edwin Howell, Ward's brother-in-law, began as a handyman and worked up to take Gilbert's place and to become the first to make relief maps, which thenceforth became a featured item of the Establishment. In 1872 he left to join Gilbert, then surveying west of the 100th meridian, but soon returned and at various times was Ward's partner in the geological end of the business, which was frequently styled "Ward & Howell." In 1890 this junior partner withdrew permanently to head his own business in Washington, opening "Howell's Microcosm," long a celebrated institution.

Frederic Augustus Lucas (1852-1929) arrived at the Rochester firm as another youth destined for greatness. He was the son of a Plymouth sea captain and had traveled widely. The Captain wrote Ward to ask what to do with a lad who was "only good to skin snakes," and Ward's reply was to "send him on." Instead of a snake, he was put to work skeletonizing a pig. Soon he became an accomplished preparator and was advanced to management of the zoological division. Lucas worked at Ward's from 1871 to 1882 and then progressed to osteologist and finally curator of the U. S. National Museum, 1882 to 1904, after which he was curator at the Brooklyn Museum and in 1911 moved on to become Director of the American Museum. Two of his numerous publications are *Animals of the Past* (1901) and *Animals before Man in North America* (1902).

Charles Haskins Townsend (1859-1944) went from Ward's to become assistant U. S. Fish Commissioner in California, and between 1883 and 1902 held various government positions. From 1902 to 1937 he was Director of the New York Aquarium. He wrote widely on fishes and general zoology.

William Morton Wheeler (1865-1937) after his work at Ward's taught at the Universities of Chicago and Texas, spent the years 1903-1908 as curator of invertebrates at the American Museum, then went to Harvard as professor of entomology. He is renowned for his work with social insects and wrote numerous books and papers, including the classic *Social Life Among the Insects*, 1923.

Other "Alumni"

Others, for rapid mention, are: A. B. Baker, foreman at Ward's who became Director of the Washington Zoological Garden; W. S. Barnard, professor of zoology at Cornell; W. B. Barrows, zoology, Michigan State; Charles Livingston Bull, famous animal illustrator; G. H. Chadwick, geologist; F. C. Hill, Princeton; James Orton, Vassar, Ward's lifelong friend; Petit, entomologist; and Staebner, natural sciences.

Of professional artisans and technicians, there has been a long parade of notable ones at Ward's. The Professor imported Louis Roch from Paris, an expert in the delicate art of preparing small skeletons, and tells the tale that Roch would jealously cover up his work when anyone entered the room. Jules Bailley, an import of wider experience, included the specialized know-how of mounting human skeletons among his accomplishments. It was Bailley who taught young Charles Ward and it is said that at one time or another every important preparator in the museums of America worked with Bailley at Ward's.

Crisos Kirchof was a remarkably clever osteologist, and passed on his skill to his son Oscar, who has supplied many of the present generation of teachers of comparative anatomy. Johannes Martens, noted preparator, came from Holland; John Walton was a skilled artist; Manuel Santus was much in demand as a taxidermist; Edmund Gueret, osteologist, later went to the Field Museum, Joseph Santaens to the Rochester Museum, and his brother Remi to the Carnegie in Pittsburgh. Fritz Burguet and Antonio Mancini were artists in plaster and Robert Koheler with wood. It was reported that Koheler, cabinet maker and carpenter, had visited nearly every state in the union with Ward's products, installing museum cases. The Mirguets, father and sons, went to the Carnegie Museum. Frederic Burgie specialized in restoring mammoth skulls and skeletons, and was loaned out as discoveries required. Thus Ward's supplied the museums of America not only with the exhibits but also with the artisans, specialists, and directors. Truly Henry A. Ward was *The Museum Builder* beyond compare.

Again we must record our indebtedness to the book, *Henry A. Ward, Museum Builder to America*, by his grandson, Roswell Ward, published by the Rochester Historical Society (Pub. XXIV) in 1948, unfortunately now out of print. We hope the reader of our first two articles on the history of Ward's will be stimulated to borrow this volume from his local library and peruse the whole account; it is one of the most fascinating biographies of any American. In our next installment we shall carry the career of this distinguished man to its conclusion, and pursue the fate of the Establishment he founded when others took the helm.

Microbe's Contribution

Preoccupation with the higher forms of life at the expense of the microorganisms results in a distorted picture of the potentialities of life, contend A. J. Kluyver and C. B. van Niel in their *The Microbe's Contribution to Biology* (Harvard University Press, 1956, $4.00) This book is based upon the Prather Lectures given at Harvard in 1954, and presents the case of the microbe as crucial in formulation of fundamental biological concepts.

(continued from other side)

Let JOHN KIERAN tell you about . . .

An exciting new Nature Program* from the National Audubon Society

***Read below about an amazing FREE OFFER**

JOHN KIERAN

Author of An Introduction to Birds, An Introduction to Trees and An Introduction to Wild Flowers, his amazing fund of knowledge has delighted millions on radio and TV

"NOTHING is more rewarding," says John Kieran, "than the study of nature in bringing parents and children together in a relaxed yet studious atmosphere. The National Audubon Society's new Nature Program combines good fun and entertainment with sound information. The full-color pictures are well chosen and well reproduced — the text is informative — and the subjects amount to an excellent basic nature library. I've tried out the Nature Program on my grandchildren — they love it!"

THE FREE GIFT described below (Value $2.00) will introduce you and your family to a thrilling new experience. Now you can discover the wonders of Nature *at home*, under the guidance of friendly, inspired naturalists.

This revolutionary "Museum-at-Home" program has captured the imagination of thousands of families. With the aid of magnificent color photographs — and fact-filled albums in which to mount them — this program takes you "into the field" on a fascinating quest after Nature's marvels, oddities and secrets. *Best of all, your naturalist-guides will open your eyes to the wonders you can discover in your own backyard or park!*

Each month a fascinating new topic is selected and a set of about 30 color prints is issued, together with an album in which to mount them and a text that explains your "Museum-at-Home" exhibits. As a *demonstration*, you may have the current set "CAMOUFLAGE IN NATURE" *plus* the illustrated handbook "FUN WITH BIRDS" as an ABSOLUTELY FREE gift package. Send coupon now.

Begin with a FREE set;

withdraw whenever you wish.

Keep future albums in this Free case!

If you send the coupon at once, you will receive CAMOUFLAGE IN NATURE *absolutely free of charge.* Your Free Gift set includes 30 color prints, informative album *and* a beautiful case for your "Museum-at-Home" collection. In addition, while they last, you may have the illustrated handbook "FUN WITH BIRDS" showing how to attract, identify and enjoy Nature's most interesting creatures. *You assume no obligation when you send for this FREE set.* You may resign your enrollment anytime. However, we feel sure you will wish to continue these monthly "visits" — the total cost is only $1 for each set, plus a few pennies for shipping. Mail the coupon today for your FREE introductory package.

CUT OUT CARD AND MAIL

NO POSTAGE REQUIRED

FIRST CLASS
Permit No. 3
(Sec. 34.9, P.L.&R.)
Garden City, N. Y.

BUSINESS REPLY CARD

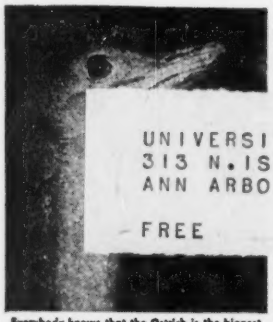
No Postage Stamp Necessary If Mailed In The United States

4¢ POSTAGE WILL BE PAID BY—

THE AUDUBON NATURE PROGRAM,
Dept. NM-3
Garden City, N. Y.

UNIVERSITY MICROFILMS
313 N. 1ST ST.
ANN ARBOR, MICH.
FREE

An exciting new way you and the children can learn about the wonders of NATURE!



Everybody knows that the Ostrich is the biggest living bird. But did you know that it can run 30 miles an hour—that its kick can kill a man—that it has the largest eyes of any land creature?

In an ordinary woodland pond you can find an amazing variety of fascinating creatures. Your Nature Program tells you what to look for, how to go about it.

Discover awesome prehistoric titans, like the Stegosaurus—fifteen feet of armor-plated might, with a brain no larger than a walnut!

But when autumn comes, the weather gets colder, and he starts to change color. By the time the ground is covered with snow...

...he has become entirely white. Perfectly camouflaged once again, he is "invisible" to his enemies!

Which is the fragile flower and which is the flesh-eating animal? On the left is the lovely bloom of the Tulip Tree. But the "blossom" on the right is a hungry Sea Anemone, and its "petals" are waving tentacles, reaching out for prey!

See the mysterious, exciting life of Nature after dark—the great owls who hunt their prey in almost total darkness—all the strange creatures who live by night!

Meet the lovable children of Nature—like the shy, tree-dwelling Koala, the model for the original "Teddy bear."

Collect a "Museum-at-Home" of butterflies like the lovely Tiger Swallowtail.

Explore the underwater world through the Nature Program's color cameras!

THE NATIONAL AUDUBON SOCIETY INVITES YOU TO ACCEPT THIS EXCITING FREE OFFER (VALUE $2.00)

to introduce you and your family to this

WONDERFUL NEW NATURE PROGRAM

THE AUDUBON NATURE PROGRAM, Dept. NM-3, Garden City, N. Y.

Please send me FREE my introductory package, consisting of the CAMOUFLAGE IN NATURE collection of 30 natural color prints; a 7500-word informative album to mount them in; a handsome maroon-and-gold colored album case; and the illustrated handbook FUN WITH BIRDS — all FREE. I understand that you plan to issue a new Nature series each month in cooperation with the National Audubon Society, for only $1.00 each plus a small charge for shipping. After examining my FREE set, I'll notify you if I do not wish any others. I may cancel my subscription at any time I wish without further obligation.

NAME.....
(Please Print)

ADDRESS.....

CITY.....ZONE.....STATE.....

SEND NO MONEY — MAIL COUPON PROMPTLY

Right now is an excellent time to find out about the National Audubon Society's new Nature hobby! If you act at once, you may have FREE the current album "CAMOUFLAGE IN NATURE," complete with 30 full-color prints—the illustrated handbook "FUN WITH BIRDS"—and a sturdy, handsome case in which to store your albums.

Turn the page and read what famed naturalist JOHN KIERAN has to say about the Nature Program, then tear out and mail the postage-paid postcard while this offer lasts!

CUT OUT CARD AND MAIL

NO POSTAGE REQUIRED